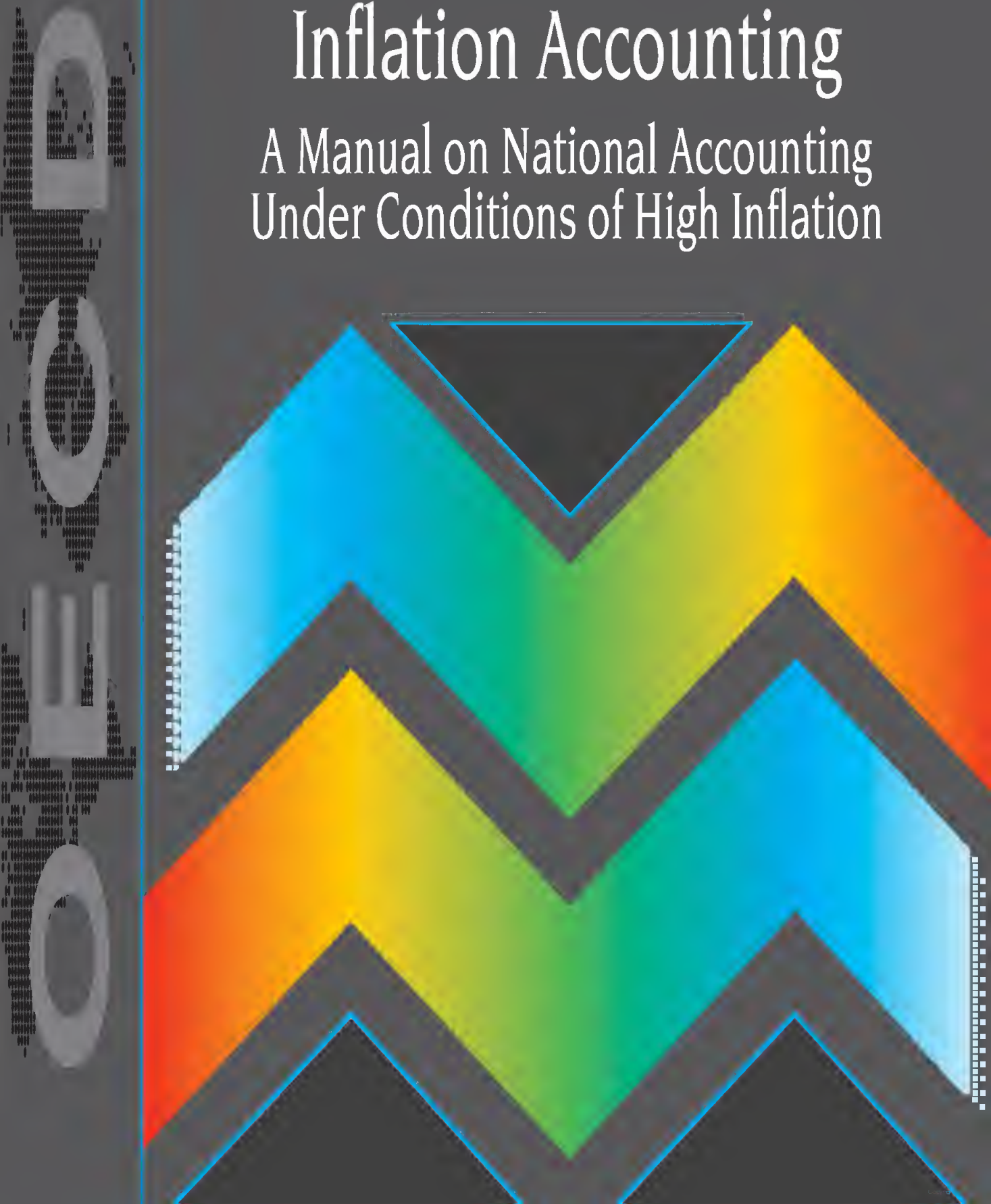
# Inflation Accounting

## A Manual on National Accounting Under Conditions of High Inflation



STATISTIC DIRECTORATE

# INFLATION ACCOUNTING

## A *Manual on National Accounting under Conditions of High Inflation*

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

## ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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# INTRODUCTION

This manual is one of a series that the Organisation for Economic Co-operation and Development and other international organisations intend to publish in order to encourage and support the use of the 1993 System of National Accounts (SNA) as a global system of macroeconomic statistics.

Inflation, the subject of this manual, is not a problem for many OECD Member countries at the time of writing. However, over the last two decades, several Member countries have experienced short periods of inflation high enough to require use of the special accounting techniques described in this manual. Another, more immediate, reason for publishing a manual on this topic is that the Organisation is engaged in policy dialogue with countries in Central and Eastern Europe, in Latin America and in Asia, some of which are experiencing very high rates of inflation. This manual is directly relevant for these countries in compiling the macroeconomic statistics required to support this dialogue.

## THIS MANUAL AND THE 1993 SNA

This manual is intended primarily for countries with high inflation. Any country whose general price level more than doubles in the course of a year clearly falls into this category, but serious economic accounting problems begin to occur at annual rates of inflation well below 100 per cent.

High inflation is addressed only briefly in the 1993 SNA because is not designed to deal with all the complexities which can arise under unusual economic conditions. The implementation of the SNA under the exceptional circumstances of high inflation requires not merely further elaboration and clarification of certain points but also additional guidlines and recommendations which go beyond the subjects dealt with explicitly in the 1993 SNA. This manual is essentially an extension of the SNA and it should not be interpreted as implying that the SNA needs to be changed or modified under conditions of high inflation.

The present manual builds on the 1993 SNA to which frequent cross reference is made. It is fully consistent with the 1993 SNA in the sense that, if the rate of inflation fell to zero, accounts that implement the additional proposals contained in the present manual, notably the "constant price level" accounts, would coincide, in practice, with ordinary SNA accounts. The proposals have less and less impact as inflation declines and become superfluous when the general price level is stable.

## CONTENTS

The first chapter is an executive summary. It summarises each chapter of the manual and helps readers who are interested in only certain topics to find them without reading the whole manual.

Chapter 2 provides a short introduction to the SNA as an integrated system of interdependent economic accounts and uses these accounts to explain why modifications, such as the inclusion of holding gains or losses in income, cannot be made without destroying the system.

Chapter 3 addresses the problem of how to compile annual accounts at current price that are economically meaningful and useful for analytical and policy purposes under conditions of high inflation. The solution proposed is to compile accounts for sub-periods which are as short as possible and to scale these up or down to the same general price level, such as that at the middle of the year, using a general price index. The sub-period accounts can then be aggregated to obtain meaningful annual accounts in which the general price level is constant throughout the year.

Chapter 4 examines the compilation of national accounts at constant prices under high inflation and explains that, when the periods being compared are as long as a year, it is necessary to take account of the price changes occurring **within** each of the years as well as **between** them.

Chapter 5 examines the valuation of certain kinds of financial assets and the appropriate way in which to measure the nominal holding gains or losses on such assets, especially when they are index linked, under conditions of chronic inflation.

Chapter 6 is devoted to the production account. The main problem is to ensure that processes of production which take time to complete are recorded in accordance with SNA accounting rules under high inflation.

Chapter 7 deals with the income accounts and in particular with the relationship between real holding gains and income and the related question of the treatment of high nominal interest payments under high inflation.

The final chapter examines what is the most suitable general index of inflation in an economy, such an index being needed for analytic and policy purposes as well as for accounting purposes.

## DATA PROBLEMS

The compilation of satisfactory accounts under high inflation is more complicated and needs more information than when inflation is low. High inflation requires the year to be divided into sub-periods which are as short as possible in order to minimise the price variation within each sub-period. Unfortunately, however, compiling accounts more frequently is obviously more difficult and imposes extra burdens on suppliers of data as well as compilers. The rapid changes in prices under high inflation also make it difficult to obtain reliable data.

The very detailed data on transactions, prices and quantities for individual sub-periods needed to implement the full set of SNA accounts using the procedures described in this manual are unlikely to be available in practice in countries experiencing high inflation. In these circumstances, the best policy may be to devote the available resources to compilation of the main aggregates of the system – in particular final expenditures on the GDP and value added by kind of activity – in order to ensure that these key aggregates are correctly estimated using the recommended procedures. It will generally be more useful to produce reliable estimates of these basic aggregates than to try to produce a complete set of accounts which may be so biased as to be harmful for purposes of economic policy.

# 1. EXECUTIVE SUMMARY

## CHAPTER 2: THE ACCOUNTING STRUCTURE AND PRINCIPLES OF THE SNA

The purpose of the chapter is to give an overview of the accounting structure and principles of the SNA so that the consequences or implications of any modifications to the system that may be required under high inflation can be examined and evaluated. Except for the "other" changes in assets account, the flow accounts of the SNA are all transactions accounts in which the entries are based on transactions between institutional units. Transactions are recorded using double entry bookkeeping whereby each party records balancing credit and debit entries. Thus, each transaction generates four entries of equal value in a set of macroeconomic accounts covering both parties. The entries in the transactions accounts of the SNA are therefore interdependent and the set of transactions accounts as a whole – the sequence from the production account to the financial account – comprises an integrated system in which only n–1 of the n entries are independent. Various accounting identities can be derived from this system, of which the identity between the balancing item of the financial account and that for the non-financial accounts as a whole is the most important from both an accounting and an economic viewpoint. The integrated transactions account provides a very compact presentation of the system as a whole and a convenient framework in which to analyse the accounting problems created by high inflation.

The distinction between monetary and non-monetary transactions is explained. The latter consist of barter transactions and payments in kind in which genuine transactions take place between different institutional units, but without the use of money, and also certain internal transactions that are deemed to take place within a single unit. Monetary values have to be imputed for the entries in the accounts associated with non-monetary transactions, but their inclusion in the accounts does not disturb any of the fundamental accounting identities referred to above. Many major flows are recorded by means of non-monetary transactions – for example, government expenditures on services produced by government establishments and household expenditures on own agricultural produce and on housing services produced by owner occupiers. Non-monetary transactions have no impact on inflation and in Chapter 8 it is argued that the relevant flows should be excluded from a general index of inflation even though this means that the price index does not cover the whole of GDP.

The integrated transactions accounts are used to examine the accounting implications of two possible modifications to the system that are often proposed under conditions of high inflation. The first involves partitioning interest flows into two components in order to separate out that part which represents the compensation paid by the debtor to the creditor for the latter's real holding loss under high inflation. It is shown that this can very easily be accomplished with minimal changes to the accounts. The second is the inclusion of real holding gains in income. It is shown that this is impossible for income accounts embedded within a set of integrated transactions accounts, as real holding gains and losses are not transactions. They must remain outside the transactions accounts, as they are in the 1993 SNA.

Finally, the Annex to the chapter examines the rather complex accounting problems created when barter exchanges are divided into two separate transactions, the second of which does not take place until some time after the first. Despite their inconvenience, there tends to be increasing resort to barter transactions under high inflation, not only by households but also by very large institutional units, including governments. When an exchange is not simultaneous, the first party establishes a claim in kind over the second and it is shown in the Annex to the chapter that the appropriate accounting treatment is equivalent to that for index linked loans, as described in Chapter 5.

## CHAPTER 3: CONSTANT PRICE LEVEL, OR CPL, ACCOUNTS

This chapter is concerned with systems of accounts under high inflation rather than with specific issues affecting individual items in the accounts. The accounting rules of the SNA are designed to ensure that economic activities, and the goods and services associated with them, are appropriately recorded and valued at the times they take place. The rules are precise and robust. They do not need to be modified when there is high inflation.

Although activities and flows of goods and services may be correctly valued as they take place, when there is high inflation activities and flows towards the end of a year are valued at much higher prices than those at the beginning. Accounts at current prices simply add together the values of these flows even though they are not commensurate. This is the central problem of accounting under high inflation.

The chapter starts by re-examining the economic rationale underlying the aggregation of different values in the accounts. At a given point of time, the values of different kinds of goods and services may be aggregated because their relative prices reflect both their relative costs of production and their relative utilities to users, whether producers or consumers. However, when accounts are compiled by aggregating over both products and time under conditions of high inflation, the economic significance of the relative prices of the same product at different points of time within the same accounting period is quite different from that of the relative prices of different products at the same moment of time. The former mainly reflect the rate of inflation and have nothing to do with opportunity costs or utilities to users. Accounts at current prices, however, are incapable of distinguishing inter-temporal relative prices for the same product from inter-product relative prices at the same moment of time. Under high inflation, quantities recorded towards the end of the year are implicitly treated as if they were markedly superior qualities of the same products earlier in the year.

This fundamental defect of current accounts under high inflation can be remedied by adjusting the values of flows at different points of time so that they are all expressed at the same general price level. This can be achieved by dividing the values in successive sub-periods, such as months, by a suitable general price index based on some convenient reference point, such as the middle of the the year. This rescaling of the accounts effectively stabilises the purchasing power of the currency used as the *numéraire* in the accounts. The resulting accounts are described here as **constant price level, or CPL, accounts**.

Support for CPL accounts is also provided by the economic theory of inter-temporal resource allocation. In order to draw up optimal production or consumption plans covering a succession of different time periods, economic theory requires the values of flows occurring in later periods to be discounted using an appropriate rate of interest. Discounting equalises the values of flows in different time periods for decision taking purposes. In the absence of inflation, discounting over short periods of time such as months has a negligible effect as interest rates are usually only a few per cent per year. Under high inflation, however, nominal interest rates may be expected to rise to match the rates of inflation, especially when loans are index linked. It then becomes necessary to discount over much shorter periods than a year. If the interest rate is approximately equal to the rate of inflation, rescaling the accounts to a constant price level becomes more or less equivalent to discounting them. The resulting accounts may be more informative than the original accounts at current prices for decision taking and policy making purposes.

Moreover, it is shown in the Chapter 4 that CPL accounts are also needed to calculate price and quantity indices between different years. Ordinary accounts at current prices containing a great deal of price variation as a result of high inflation do not provide a suitable basis for annual price and quantity comparisons. This point is elaborated in the following chapter.

Most of Chapter 3 is devoted to explainng how CPL accounts may be calculated, what are their properties and how they may be expected to differ from the ordinary current accounts from which they are derived. It should be noted that a standard set of SNA accounts is required first in order to calculate CPL accounts. They supplement current accounts and do not replace them.

The first step is to compile current accounts for sub-periods of the year which are as short as possible – quarters or, if it were feasible, months. The chapter recognises the increased difficulties and costs incurred by both compilers and suppliers of the basic data when accounts have to be compiled

more frequently and for shorter time periods. Nevertheless, accounts for short sub-periods are needed in any case under high inflation in order to minimise the amount of price variation within each accounting period.

In order to compile annual CPL accounts, the entire set of accounts for each sub-period has to be divided by a general price index, preferably one based on the middle of the year. This is no more than a simple rescaling exercise. The annual CPL accounts are then obtained by adding together the rescaled accounts. The chapter uses a numerical example based on the integrated transactions accounts of Chapter 2 to illustrate how the CPL accounts are constructed and how they differ from the original unadjusted accounts. Whereas the annual current accounts under high inflation are largely dominated by the high monetary values in the later part of the year this distortion is removed in the annual CPL accounts. The differences between the two sets of accounts become more pronounced, the more variable are economic activities and behaviour patterns during the course of the year. Balancing items such as the operating surplus, saving and net lending are the most sensitive to the transformation of ordinary accounts at current prices into CPL accounts. They may even change signs and thus convey quite different signals to users of the accounts.

In addition to rescaling the accounts for each sub-period on the basis of a single general price index, it is possible to revalue the individual flows of goods and services at their own constant prices. To avoid confusion with the CPL accounts, such accounts are described as accounts at constant intra-period prices, or CIP accounts. CIP accounts have to be confined to accounts consisting of flows of goods and services whereas a complete system of CPL account can be compiled. The chapter explains how insights may be obtained into the the redistributive effects of inflation by subtracting CPL values from CIP values, when both are available, to derive the "trading" gains or losses accruing to different groups within the economy as a result of changes in relative prices during the course of the year.

Finally, the chapter also notes that CPL balance sheets may be calculated and explains how they relate to the CPL flow accounts. As the general price level is held constant between CPL balance sheets, any change in the value of an asset must reflect a real holding gain or loss as it must be due to a change in its relative price. The CPL accumulation accounts and balance sheets may therefore provide a convenient way in which to estimate real gains and losses.

**CHAPTER 4: PRICE AND QUANTITY MEASUREMENT**

Conventional index number theory is mostly concerned with comparisons between **points** of time whereas, in national accounts, price and quantity comparisone have to be made between discrete **periods** of time. Significant changes in prices and quantity flows may occur not only between different periods but also within a single accounting period, especially one as long as a year. Indeed, the central problem of accounting under high inflation is that prices are much higher at the end of the accounting period than at the beginning. These price differences are not differentiated in the accounts from price differences that reflect differences in quantum or quality between different kinds of goods and services at a given moment of time. Annual quantity comparisons in particular are complicated by the fact that identical quantities of the same homogeneous product are not valued uniformly within each year. The construction of annual price and quantity indices throws into sharp relief some of the fundamental problems encountered in the compilation and interpretation of accounts under high inflation.

The first part of the chapter examines annual price and quantity comparisons for a single homogeneous product. This may be a trivial question in the absence of inflation but becomes complicated when the price of the product is rising strongly during the course of each year. The quantity comparison for a homogeneous product is given by the ratio of the total quantities in the two years. The indirect price comparison obtained by dividing the ratio of the current values by this quantity ratio equals the ratio of the two annual average prices, each average being weighted by its own quantities. This ratio varies in response to changes in the timing of the quantity flows between the two years and is not a satisfactory price measure for this reason. An acceptable price measure would be one based on annual average prices which both use the same quantity weights, those of one or other year. However, the indirect quantity measure obtained by deflating the change in values by such a ratio is not equal to the ratio of the total

quantities. Thus, when there is inflation, it is not generally possible to partition changes in annual values into price and quantity components both of which are satisfactory measures in their own right. It follows that such partitioning will not be feasible at an aggregate level either.

The underlying problem is not a traditional index number problem. It stems from the use of current value data as inputs into the calculation indirect price or quantity measures under high inflation. Current accounts permit identical quantities of the same homogeneous product to be valued at very different prices during the course of the same year. Implicitly, quantities sold at higher prices later in the year are treated as if they were superior qualities when they are not. This conceptually incorrect treatment is carried over into indirect price or quantity measures derived from changes in annual current values. The implications are significant. For example, annual quantity indices should not be derived by deflating annual current values by conventional price indices under high inflation.

Under high inflation, accounts at current prices do not provide a suitable basis for compiling annual price and quantity indices. Nevertheless, the second section of the chapter investigates the properties of standard index numbers when they are in fact calculated from values at current prices. The point of departure is that, within each of the years being compared, there is not a single price for each product but a range of ascending prices. It is necessary to recognise these different prices and the quantities associated with them by breaking down each year into sub-periods which are as short as possible. Ordinary price or quantity indices may then be calculated by utilising all the individual prices and quantities in the sub-periods in the two years. However, such indices give more weight to identical quantities of the same product in the later sub-periods when prices are higher. They implicitly treat them as if they were superior qualities when they are not. A numerical example is used in the chapter to illustrate how a Laspeyres quantity index may yield annual changes which are unacceptable both conceptually and analytically. To avoid valuing identical quantities of the same product at different prices, it is possible to define alternative annual indices which utilise the total quantity of each product in each year and its associated annual average price instead of the individual sub-period prices and quantities. Annual quantity indices defined this way perform much better in terms conventional index number criteria. Nevertheless, they are still not optimal because the average prices are dominated by the prices towards the end of each year whose pattern may not be representative of prices during the year as a whole. It is also not easy to obtain information on the total quantities and annual average prices of individual products. It may be possible, however, to the estimate the approximate values of the annual indices by taking suitably weighted averages of the indices connecting the individual sub-periods in the two years.

The final section of Chapter 4 explains how the kinds of problems discussed in the previous paragraph may be resolved by basing the annual price and quantity indices on the CPL accounts instead of the accounts at current prices. For this purpose, the CPL accounts for each year may be scaled so that the total value of the relevant aggregate is the same in the CPL and the current accounts. Standard price and quantity indices such as Laspeyres and Paasche may then be calculated using the price and quantity data for the individual sub-periods in the CPL accounts. In practice, the annual indices can be calculated very easily by averaging the sub-period indices using the sub-period CPL values as weights. The Laspeyres and Paasche quantity indices for the sub-periods themselves are actually the same whether they are calculated at the actual prices of the sub-period or at CPL prices, because all the prices in the same sub-period are multiplied by the same scalar to obtain the CPL prices, although each sub-period price index needs to be adjusted by the ratio of the scalars in the two years to convert them into CPL indices.

Switching from accounts at current prices to CPL accounts does not, of course, completely eliminate price variation within the annual accounts. Variations in **relative** prices remain, in the same way as in current accounts under zero inflation. Changes in relative prices, however, are economically different from inflationary price changes. They are likely to reflect changes in quality resulting from changing supply or demand conditions. Seasonal variations in prices provide examples. As argued in the 1993 SNA, and much earlier by Stone (1956), differences in the prices of seasonal products at different times of the year may be assumed to reflect qualitative differences in the products concerned. In order to treat them as such, annual indices have to be calculated as weighted averages of the sub-period indices, even when there is no inflation. When there is inflation, the CPL values provide the requisite weights, and the resulting annual indices are theoretically sound.

## CHAPTER 5: ASSET PRICES, HOLDING GAINS AND INDEXATION

The purpose of the chapter is to explain how nominal and real holding gains are calculated on various types of assets. The nominal holding gain or loss on an asset is equal to the change in its monetary value between two points of time purely as a result of a change in its price and not because of any improvement or deterioration in its quality. Any change in the value of an asset resulting from a change in its characteristics – *e.g.* wear and tear, or obsolescence, for a fixed asset or the addition of reinvested interest to a security – is recorded in one of the other accumulation accounts and not as a holding gain or loss in the revaluation account.

It is not always easy to identify appropriate quantity units and corresponding prices for financial assets. Prices have to be expressed in terms of some *numéraire*, the national currency normally serving as the *numéraire* in business and national accounting. The price of a unit of the *numéraire* has to be unity, by definition, and cannot change. There can be no nominal holding gains, therefore, on assets which consist essentially of quantities of the *numéraire*, including money deposited with financial intermediaries or on loan to other units, although creditors incur substantial **real** holding losses under high inflation as the purchasing power of the national currency unit declines. On the other hand, there may be nominal holding gains or losses on deposits or loans denominated in foreign currency as the price of a unit of foreign currency in terms of the *numéraire* national currency changes whenever the foreign exchange rate changes.

In contrast to deposits and loans, securities such as bills and bonds that are traded on financial markets have market prices of their own that diverge from their nominal or par values. Changes in their market prices due to interest rate changes generate nominal holding gains or losses which are, however, offset subsequently by opposite changes in interest flows. These holding gains must be distinguished from increases in the values of securities issued at a discount that are attributable to the reinvestment of accruing interest which is recorded in the financial account as increasing the size of the asset. Increases in asset values due to increased lending are not holding gains.

Under high inflation it is common for indexation procedures to be agreed between creditors and debtors whereby the principal of a loan, or the par value of a security, is increased periodically in proportion to the increase in some price index or the price of an individual commodity. As such increases are not caused by an increase in the price of the asset itself they are not holding gains. As already noted, the price of the *numéraire* currency is fixed at unity so that the values of the quantities of currency on deposit or loan can only be increased by augmenting the quantities by additional lending. Under an indexation agreement this additional lending is financed out of a transfer of equal value payable by the debtor in compensation for the **real** holding loss incurred by the creditor. The whole point of an indexation agreement is to prevent the creditor's **real** net worth from being reduced by providing compensation for this loss. The payment of compensation is recorded in the capital accounts of both parties. When the interest on a loan is index linked instead of the principal, the total interest paid is partitioned into two components one of which is recorded in the capital accounts as payment of compensation, while the remainder is real interest recorded as property income. Index linking the interest leaves the creditor free to dispose of the compensation received in whatever way is preferred, whereas when the principal is index linked there is a commitment to lend it back again to the debtor. Index linking the interest increases the creditor's cash flow whereas index linking the principal does not.

Claims in kind that result when a barter exchange is divided into two separate transactions that take place at different times are formally equivalent to loans that are index linked to the price of the item to be exchanged in the second transaction. Compensation is recorded as being received by the first party to balance the fact that the monetary value of the "use" recorded for the second item is greater than the "resource" recorded for the first when there is high inflation.

The final section of the chapter examines the effects of using alternative *numéraires*. The very high nominal holding gains on physical assets that occur under high inflation are, of course, eliminated when the *numéraire* is switched from a rapidly depreciating currency to a unit such as a gram of gold, whose value relative to other goods and services is comparatively stable or possibly increasing. Not only may the magnitudes of nominal holding gains be completely changed but they may be transformed from gains to losses, or *vice versa*. Nominal holding gains are so sensitive to the choice of *numéraire* that their

economic significance can be obscure. On the other hand, real holding gains and losses depend on changes in relative prices that are invariant to the choice of *numéraire*. Similarly, the relative sizes of the real gains or losses on different items are also invariant to the choice of *numéraire*. Real holding gains and losses change real net worth and may have a significant impact on economic behaviour. For example, the real losses that creditors expect to incur under high inflation lead them to change the conditions on which they are prepared to lend money, either by requiring indexation or very high rates of nominal interest.

As holding gains depend on changes in prices it is not obvious at what prices they are themselves expressed. It is shown that real holding gains, as defined in the 1993 SNA, are valued at the general price level prevailing at the end of the period over which they accrue. Realised real holding gains are valued at the price level at the time the asset is disposed of or used, while unrealised gains are valued at the time the closing balance sheet is drawn up. Under high inflation, therefore, the purchasing power of the real holding gains accruing over an accounting period is less than the average for receipts over the same period.

**CHAPTER 6: PRODUCTION ACCOUNTS**

The two basic accounting rules governing the entries in the production account are that inputs and outputs must be recorded at the times they are used or produced and valued at the prices prevailing at those times. These rules imply the use of current, rather than historic, cost accounting. If historic cost accounting is used, output is overvalued, and intermediate consumption undervalued, by the nominal holding gains accruing on outputs and inputs while they are held in inventories. The combined effect is to impart a serious upward bias to value added and the operating surplus, a bias which increases with the rate of inflation. When changes in inventories are valued at the prices prevailing at the times the changes occur, in accordance with the SNA's rules, the holding gains on inventories are excluded from gross value added. Consumption of fixed capital must also be valued at current costs to ensure that nominal holding gains on fixed assets are similarly excluded from net value added.

Under high inflation a good enters inventories at one price and is withdrawn later at a higher price thereby generating a positive nominal holding gain for the owner. On the other hand, the use of the SNA's accounting rules implies that the combined value of the two inventory changes is also equal to the difference between the two prices, but negative. There is therefore an inverse relationship between changes in inventories and nominal holding gains under high inflation, although the two are not equal when the quantities of inventories change. This inverse relationship becomes more pronounced and significant the higher the rate of inflation. It affects additions to, and subtractions from, work-in-progress equally. For example, in the case of a long production process such as crop production there is a gradual build up of work-in-progress followed by a run down when the crop is harvested and disposed of. Under high inflation, substantial nominal holding gains accrue on the work-in-progress which are realised when the production is completed. However, the SNA's rules for the valuation of changes in inventories mean that, in order to calculate the value of output, the value of the sales must be reduced by the negative value for the change in work-in-progress over the production period as a whole. In this way, the holding gains realised on the work-in-progress are excluded from the value of output and value added.

The Annex to the chapter contains a numerical example illustrating the precise way in which to calculate the changes in inventories and holding gains for a production process of long duration in which all the output consist of work-in-progress up to the moment the process is completed. It shows that under high inflation the nominal holding gains on work-in-progress may easily be much greater than the value added produced and many times larger than the operating surplus. Thus, the correct recording of inventories and holding gains is not just a technical refinement under high inflation. If the rules are not, or cannot be, followed the resulting accounts may be completely worthless and highly misleading. Of course, many industries have short production periods with a steady flow of finished output and do not hold large inventories of either inputs or outputs. The compilation of production accounts for such industries, which include many service industries, do not present the same problems under high inflation.

The chapter points out that the capital, or opportunity, costs of financing the ownership of the goods on which nominal holding gains accrue are also sharply increased by high inflation. For example, when the holding of inventories is financed out of a loan, the real holding losses that creditors incur on their loans are usually recovered either by charging appropriately high rates of nominal interest or indexing the principal. The capital costs consist of both the compensation payable to creditors for their holding losses and the real interest. The production accounts of the SNA can ignore the large payments of compensation under high inflation because the nominal holding gains on the assets used in production are not counted as "resources". The compensation should be recorded in the capital account of the SNA where it may be offset by a negative figure for changes in the inventories financed by the loan. The nominal holding gains themselves are recorded in the "other" changes in assets account of the SNA, outside of the transactions accounts.

Under high inflation, production accounts must be compiled at least quarterly, and preferable monthly, in line with the general recommendations of this manual that the year must be divided into sub-periods. The sub-period accounts may be used to compile CPL production accounts. An example is given in the chapter showing that if profitability is increasing, or decreasing, over the course of the year, the ordinary annual current accounts will tend to exaggerate, or understate, profitability for the year by giving too much weight to the accounts for the later sub-periods. The CPL accounts correct for this. CIP accounts may also be calculated for the sub-periods. As CIP accounts can only be calculated for accounts whose entries consist of flows of goods and services, they are particularly relevant for production accounts.

In the final section of the chapter, the CPL and CIP accounts are used together to show how the trading gains or losses of producers over the course of the year may be derived simply by subtracting one set of figures from the other. These gains or losses depend on changes in the **relative** prices of the inputs used and outputs produced over the year. As relative prices may be more volatile under high inflation, these gains or losses may have a significant impact on value added and profits.

**CHAPTER 7: INCOME ACCOUNTS**

This chapter addresses two main questions. First, should the income accounts of the SNA be modified to take account of real holding gains and losses on assets? Second, should the recording of interest in the primary income account be changed from nominal to real interestwhen there is high inflation? The two questions are inter-related.

The chapter starts by reviewing the standard economic concept of income as advocated by Hicks (1946) and others. The concept of income that is relevant to economic behaviour is an *ex ante* one, according to Hicks. Spending plans are drawn up on the basis of current wealth and expectations about receipts in the current and future periods. Income is then defined as the maximum permanent rate of real consumption. "Windfall gains" (capital transfers and real holding gains in SNA terms) increase income only to the extent that they raise the rate of permanent real consumption. In the words of Hicks, "the income *which is relevant to conduct* must always exclude windfall gains; if they occur they have to be thought of as raising income in future weeks (by the interest on them) rather than as entering into any sort of effective income for the current week." (*op. cit.*, p. 179). Hicksian income is thus not equal to consumption plus the actual change in net worth, despite frequent misunderstanding on this point. The SNA criteria for distinguishing capital from current transfers (see paragraphs 8.31 to 8.33 and 10.132 to 10.135 of the 1993 SNA) are intended to help identify those receipts which have the character of windfalls, in Hicks's terms, so that they can be excluded from income. Real holding gains are also excluded as windfalls. The SNA concept of income is therefore intended to approximate as closely as possible to an economically relevant concept of income of the kind proposed by Hicks.

The second section of the chapter sets out the relevant definitions and accounting identities in the SNA involving income. The main identity in the present context is that:

disposable income (net) = final consumption expenditures

**plus** the change in real net worth
**minus** capital transfers receivable *less* payable
**minus** "other" volume changes in assets
**minus** real holding gains *less* losses.

The third section explains that under high inflation the treatment of interest must be modified to recognise the economic fact that most of the high nominal interest receivable by creditors is specifically intended to compensate them for the real holding losses they incur. The nominal interest, including indexed interest, must be partitioned into two components and the part that constitutes compensation recorded in the capital account. From an accounting point of view the change is minimal. It reduces the disposable income and saving of creditors but not their net lending. As compared with the treatment of interest in the SNA the effect is to shift the receipt of the compensation from disposable income in the above identity and to add it capital transfers receivable on the right side. These are the only terms affected. Reclassifying a flow from current to capital has no effect on net lending or the change in real net worth. When the principal of a loan is indexed instead of the interest, the whole of the interest receivable is recorded as property income in the primary income account. As explained in Chapter 3, the increase in the principal resulting from the indexing is recorded in the capital accounts of both parties as payment of compensation by the debtor. It is also recorded in their financial accounts as being lent back again by the creditor to the debtor.

Some monetary assets are non-interest bearing because they serve as a medium of exchange and are not held as investments to earn property income. They should not be treated as if they were interest bearing asets paying zero nominal interest. If there is no nominal interest there can be no real interest.

The creditor continues to incur a real holding loss on the loan under high inflation whether or not compensation is received in the form of high nominal or indexed interest. However, it can be seen from the above identity by charging high interest the creditor's real holding loss is cancelled by the compensation recorded under capital transfers receivable, so that the creditor's real net worth is protected. It should be noted, however, that the real holding loss itself continues to be recorded in the "other" changes in assets account. It cannot be moved to the transactions accounts and it is not deducted from the nominal interest to obtain real interest. Since the real holding losses on interest bearing assets are not treated as negative income flows, no precedent is created for treating the real holding gains or losses on other types of assets, including non-financial assets, as components of income. In any case, the question of whether or not to develop an expanded concept of income including real gains or losses outside of the SNA framework is not specifically about inflation accounting. Real gains or losses depend upon changes in relative prices and not on changes in the general price level. There are examples of economically important real gains or losses, for example on land, even when there is little or no inflation. These can have a major impact on the distribution of wealth in an economy. However, they are not income. From an accounting point of view, it is impossible to shift items from the "other" changes in assets account to the transactions accounts of the SNA without destroying their internal logic, coherence and consistency, as explained in Chapter 2. From an economic point of view, the justification for excluding real holding gains and capital transfers from income remains as strong as when it was argued half a century ago by Hicks.

**CHAPTER 8: A GENERAL INDEX OF INFLATION**

A general index of inflation is needed for a variety of purposes. In the SNA it is used to calculate the following: neutral and real holding gains and losses, internal and external trading gains and losses, real national and disposable income, real interest and constant intra-period price level (CPL) accounts. In business accounting it may be used for similar purposes, such as Current Purchasing Power accounting. A general price index is needed for policy purposes to monitor the general rate of inflation and to set inflation targets. It may also be used to implement indexation agreements under conditions of high or chronic inflation. Although indices such as the Consumer Price Index or GDP deflator are often used as proxies for a general price index they are not the optimal choice, being designed to meet other more specific needs.

After a review of the various types of price indices already compiled in most countries, the chapter examines four possible general price indices based on the flows of goods and services recorded in the supply and use tables shown in Chapter 15 of the 1993 SNA. The first index covers total supplies or uses of all goods and services in the economy. This index gives equal weight to intermediate flows and final uses. As intermediate goods and services become incorporated in final goods and services, however, the index

may implicitly give them too much weight. If intermediate goods and services are excluded to avoid double weighting them, the second possible price index is obtained, namely that for total final uses. This index can, in turn, be viewed as weighted average of two other price indices, those for GDP and imports. From the point of view of final users, it may be immaterial whether the inflation is of domestic origin or imported. As GDP is essentially a measure of domestic production, its price index is not so comprehensive a measure of inflation as that for total final uses but for some analytic and policy purposes it may be important to know the rate of price increase of domestic value added.

Total final uses include exports. From the point of view of residents, the rate of inflation for goods and services sold to non-residents may not be important, so that a fourth possible price index is that for total domestic final uses: *i.e.*, final consumption of households, NPIs and government plus gross capital formation. This index may be suitable for the calculation of real holding gains or real interest, for example, and it is recommended for the calculation of trading gains and real national and disposable income in Chapter 16 of the 1993 SNA.

In general, the most suitable multi-purpose general price indices seem to be those for total final uses or for total domestic final uses. Whatever index is preferred, however, it must be stressed that there remains a need for a range of other price indices to meet more specific analytic and policy purposes. A general index of inflation should not drive out other indices.

Consider an economy with no inflation for which the price indices for GDP and total final uses remain unchanged. If GDP and labour productivity are growing over time because of technical progress, wage earners may be expected to secure higher living standards through increased money wages. Both the absolute and the relative prices of labour could increase indefinitely without there being any general inflation provided they are not rising faster than labour productivity. A general index of inflation has to focus on price changes for outputs of goods and services, especially outputs destined for final use. If output prices do not increase there is no inflation, even though the prices of some inputs, such as fuels or labour, might show a persistent tendency to rise over time. Wage rates, like the prices of intermediate inputs, should not be included in a general index of inflation.

All the aggregates of national accounts, such as total final uses, GDP or total domestic final uses contain major flows of goods and services which are not sold on the market and for which values have to be imputed, *i.e.*, estimated. The final section of the chapter addresses the question of whether or not goods or services which do not have market prices of their own should be covered by a general price index. There are two ways in which values are imputed in national accounts. The preferred method is to impute values using the average prices of similar products sold on the market. In this case, price changes for the latter are, in effect, given increased weight by extending them to cover products not sold on the market, such as goods or services consumed by their own producers. However, if there are no similar products on the market whose prices can be used, values have to be imputed on the basis of the costs of producing the products in question. This procedure is used for a wide range of services produced by government. In these cases, there are no output prices and there seems little justification for retaining these flows of goods or services in a general price index. The implicit price changes for these items that are recorded in national accounts are based on assumptions and not observations. On balance, it seems preferable to confine general price indices to final uses, or domestic final uses, with market prices of their own although this implies that the coverage of these aggregates is significantly smaller than that of the corresponding aggregates at current prices in the SNA. There remain problems whatever solution is adopted as a lot of economic activity, especially in the government sector, falls outside the scope of the indices if they are confined to market flows.

# 2. THE ACCOUNTING STRUCTURE AND PRINCIPLES OF THE SNA

## INTRODUCTION

The purpose of this chapter is to give a brief overview of the accounting structure and principles of the SNA. In so far as accounting under high inflation may require modifications or extensions to the SNA, it is essential to know exactly what are the consequences of such changes and how they affect the system as a whole. It is also necessary to be clear to what extent it is possible to modify the SNA without introducing changes that would fundamentally change the nature and structure of the system.

In particular, it is important to clarify the role of nominal and real holding gains and losses in the SNA. It is shown in this chapter that the transactions accounts of the SNA form an integrated interdependent system of accounts of their own. This set of accounts is not quite the same as the flow accounts, however, because it excludes the "other" changes in assets accounts in which nominal and real holding gains and losses are recorded. Although recorded in one of the flow accounts of the system, holding gains are not transactions. The distinction between transactions and other flows is fundamental from an economic accounting point of view. It is impossible to record in the transactions accounts items that are not transactions as this would violate the principles of double and quadruple entry accounting on which national accounts are based. Whereas items may be reclassified and moved from one transactions account to another without destroying the logic and coherence of the system, they cannot be moved from the "other" changes in assets account to one of the transactions accounts. Nominal or real holding gains cannot therefore be recorded in the income accounts of the system without completely changing the system and the meaning and significance of its main aggregates. On the other hand, transactions such as nominal interest payments can be partitioned into two components, one component being classifed as a capital transaction instead of a current, with only a very small effect on the structure of the accounts.

The purpose of this chapter is therefore to define and explain the different kinds of transactions recorded in the SNA and to demonstrate how the transactions accounts fit together to form a complete and self contained system of accounts. The resulting integrated set of transactions provide a very simple and compact presentation of the SNA which can be exploited to examine the feasibility and implications of alternative accounting procedures that may be contemplated under conditions of high inflation.

## TRANSACTIONS

The accounts of the System, except for the *Balance Sheets* and the *Other Changes in Assets Accounts*, record the values of transactions or balancing items derived from transactions. A transaction is an exchange or similar interaction that takes place between two institutional units, generally described as the two parties to the transaction. Three types of economic action may occur:

1. the ownership of a good or existing asset may be transferred from one party to the other;
2. a service may be provided by one party to the other;
3. a financial claim of one party over the other may be created or extinguished.

An economic action taken by one party creates a claim over the other party which is normally cancelled by a counterpart action taken by the second party. For example, the claim established by the provision of a service may be cancelled by the transfer of a financial asset by the second party. A transaction typically consists of a pair of linked economic actions, one of which is the counterpart to the other. However, a transaction may consist of only a single economic action if it is agreed that it does not

give rise to a claim and no counterpart is needed. Such transactions are generally described as transfers. In certain circumstances an internal transaction may be deemed to take place within a single institutional unit when a good or service produced by a unit is retained for its own final use.

**The recording of transactions**

Transactions are recorded in the accounts using traditional double entry bookkeeping. This method of recording requires each party to a transaction to make two counter balancing entries for each transaction, one of which is recorded as a credit and the other as a debit. In the non-financial accounts of the system a credit entry is recorded under **resources** while a debit is reorded under **uses**. For example, the value of output sold by one party to another will be recorded for the seller under **resources**in the production account, and the counterpart increase in *currency or deposits* in the financial account. Similarly, the purchaser records the reduction in *currency and deposits* in the financial account and the value of the item purchased under **uses** in the production or use of income accounts as intermediate or final consumption. Thus, in all, four entries are needed to record the transaction. In general, in a set of macroeconomic accounts covering the two parties to a transaction, double entry bookkeeping requires two pairs of balancing entries for each transaction. Even transfers involving only a single action require four entries. The payment of a cash transfer, for example, has to be recorded either in the secondary distribution of income or the capital accounts of both parties, depending on whether the transfer is current or capital, as well as in their financial accounts.

The two actions that make up a transaction are recorded as taking place simultaneously even though they may take place sequentially, provided there is not much delay between them. For example, if A buys a newspaper from B, A may hand over the money to B and then receive the paper (or the actions may take place in reverse). It could possibly be argued that the moment A hands over the money to B, A establishes a financial claim over B and that the creation of this claim itself is the counterpart that completes a transaction. A moment or two later, B extinguishes the claim in a second transaction by handing over the paper to A. Unless the two actions are literally simultaneous, therefore, each could be regarded as creating, or extinguishing, a claim, so that two transactions are needed to complete the exchange. This interpretation is tantamount to denying that genuine exchanges ever take place as every exchange would require two separate transactions.

In practice, there is no advantage in explicitly recognising the creation of claims that are extinguished again within a few moments, so that an exchange that is completed within a short interval of time may be treated as a single transaction. Thus, a simple cash purchase is one transaction and not two. However, exchanges that are not completed the same day may involve two, or even more, separate, but connected, transactions. For example, when payment is made by cheque, the counterpart to the transfer of ownership of a good in the first transaction is the creation of a short term receivable/payable which is cancelled in a second transaction at a later date when the seller's bank account is credited with amount payable. When payment is made by a credit card the situation is more complicated with the involvement of other financial institutions besides the banks. Such delayed payments are to be handled by the creation and extinction of one or more short term receivables/payables, as necessary, each involving a separate transaction. In practice, most such receivables and payables will disappear from the accounts through consolidation, assuming that the accounting period is much longer than the time needed to clear cheques or complete credit payments. When there is high inflation delays in settlement may assume con siderable significance.

**Monetary transactions**

Transactions may be either monetary or non-monetary, both types being included in the transactions accounts of the SNA. A monetary transaction is one involving the receipt/payment of cash or the creation of a short term receivable/payable extended specifically to allow time for a cheque to be cleared or a payment by credit to be processed. Every monetary transaction must entail at least one entry in the financial account of each party to the transaction. While the counterpart to the cash or short term receivable(payable) in most transactions is a use or resource recorded in one or other of the non-financial

accounts, it could be the acquisition or disposal of some other financial asset in which case all four entries are recorded in the financial account. Most monetary transactions, however, involve one entry in the non-financial accounts and a counterpart entry in the financial account. The monetary value of the entry recorded in the non-financial account is, of course, the same as the value of the counterpart entry in the financial account. Under high inflation these values may increase substantially even within a single accounting period.

**Non-monetary transactions**

There are two main kinds of non-monetary transactions: transactions in kind and transactions internal to a single institutional unit. Monetary values have to be imputed (*i.e.*, estimated) for the entries associated with these transactions. Most transactions in kind consist of barter transactions, including the payment of wages and salaries in kind, although there are also transfers in kind. Internal transactions occur when an institutional unit engages in two different kinds of economic activity within the same period, such as production and consumption, or production and capital formation.

***Transactions in kind***

Barter transactions are transactions in which goods, services or assets are exchanged for each other without the use of currency and deposits or short term receivables/payables in lieu of cash. All such transactions are recorded in the SNA as they reflect flows of real goods, services and assets between economic units linked to real economic activities. The transactions themselves are not imputed – only the monetary values placed upon them. Under high inflation, barter transactions tend to become more common and under hyper inflation they may become the preferred method of exchange as people increasingly reject payment in money. To record such transactions, both the items exchanged must be valued at the same price. In accordance with double entry bookkeeping, each party records the item relinquished as a resource and the item received in exchange as a use, leading to four entries in the system of accounts as a whole, in the same way as for monetary transactions. Provided the exchange is completed quickly, *i.e.*, within a day, it may be treated as a single transaction, but if the item offered in exchange is not handed over until some time later, the exchange must be split into two separate transactions, as already noted. The party handing over the first item establishes a claim in kind over the other party, the claim becoming the counterpart to the first item and recorded in the financial account. The claim is extinguished in the second transaction when the second item is handed over. As explained later, the recording of barter in which there is an appreciable lapse of time between the two transactions becomes quite complicated under high inflation when prices rise significantly in the intervening period.

Barter transactions in which goods, services or non-financial assets are exchanged for each other do not involve entries in the financial account unless there is a delay in completing the exchange, as just noted. However, financial assets other than money or short term receivables/payables may be exchanged for each other (for example, shares could be exchanged for bonds) or for goods, services or non-financial assets, such exchanges also counting as barter transactions. Thus, the recording of barter transactions is not confined to the non-financial transactions accounts.

Transactions in kind also cover the payment of wages and salaries in kind, whereby labour is exchanged for goods, services or non-financial assets, and transfers in kind, such as the payment of taxes in kind.

***Internal transactions***

Transactions that take place within a single institutional unit may have to be recorded when the unit engages in two different types of economic activity in the same period, typically using output from own production for final consumption or capital formation. The output is recorded under resources in the production account and the final consumption, or capital formation, under uses in the use of income account or capital account, as the case may be. As there is no other party to the transaction, the recording of an internal transaction requires only two entries in the system of accounts as a whole.

Internal transactions are confined to the non-financial transactions accounts as a unit cannot establish a claim over itself. The SNA records all goods and services produced for own final use, **except** domestic and personal services produced and consumed by members of the same household.

## THE ACCOUNTING STRUCTURE OF THE SNA

Apart from the balance sheets and the "other" changes in assets account, the accounts of the SNA are built up from the values of items involved in transactions. These transactions are linked to the basic economic activities of production, income generation and distribution, consumption and capital formation. They are recorded in the following sequence of accounts:

Production account
Generation of income account
Allocation of primary income account
Secondary distribution of income account
Use of income account
Capital account
Financial account

This set of accounts may be described as the **transactions accounts**. The accounts from the production to the use of income account are current accounts while the capital and financial accounts are accumulation accounts. The remaining accounts of the System, the "other" changes in assets account and the balance sheets, are not based on transactions. Nominal and real holding gains and losses are recorded in the "other" changes in assets account. Because of double entry bookkeeping and quadruple entry accounting, the set of transactions accounts constitutes an integrated and articulated accounting system in itself.

### The transactions accounts as an integrated system

The systematic use of double entry bookkeeping for each party to a transaction means that the transactions accounts as a whole must balance. As each party records a **resource** and a **use**of equal value for each transaction in one or other of the transactions accounts, the **totals** of the resources and uses for the set of transactions accounts as a whole must be identical in value. This fundamental identity is illustrated in Table 2.1 using illustrative data for the total economy taken from the 1993 SNA. Table 2.1 presents a summary but complete version of the entire sequence of transactions accounts from the production account to the financial account. The various items may be disaggregated by referring back to the 1993 SNA if desired. The totals are obtained by summing all the individual entries in the accounts **except** the balancing items which do not themselves represent resources and uses. It can be seen that the total values of the resources and uses are both equal to 6 827. In Table 2.2 the individual accounts in Table 2.1 are combined into a single integrated transactions account by cancelling out the balancing items carried over from one account to the next and eliminating the boundaries between the various accounts.

The totals of the resources and uses in the integrated transaction account shown in Table 2.2 are identical even though this account has no balancing item. The balance is dictated by the double entry bookkeeping underlying the compilation of the accounts. Out of the n entries shown in the consolidated transactions account only n–1 can be independent therefore so that the value of any one entry in the account can be deduced from the other n–1. In principle, any entry could be estimated in this way and not simply the last item listed in the account. The integrated transaction account is, in fact, the SNA equivalent of a Walrasian general equilibrium system for the economy as a whole (see Hicks (1946), Chapter IV for a general description of such a system).

### Accounting identities within the integrated transactions account

The identity between the values of total resources and total uses in the integrated transactions account has important economic and accounting implications. Suppose a horizontal line is drawn somewhere within the integrated account. The difference between total resources and total uses above the line must equal the difference between total uses and total resources below the line, given that both column totals are the same. An example of this is the identity between the balancing items of the capital and financial accounts, described as *net lending/borrowing* in both cases. This identity is obtained from Table 2.2 by drawing a line above the last two items in the account, as illustrated by the lower of

the two dotted lines shown. It can be seen from Tables 2.1 and 2.2 that the difference between total resources and total uses above the line is the balancing item of the capital account of the 1993 SNA while the difference between the uses and resources below the line is the balancing item of the financial account. This particular identity is prominent in the SNA because of the order in which the sequence of transactions accounts is presented.

Other useful identities may be derived, however. Suppose a line is drawn across the consolidated account below the entries for current transfers, as illustrated by the upper of the two dotted lines shown. The difference between total resources and total uses above the line is equal to the balancing item of the secondary distribution of income account, *disposable income*. However, this same balancing item can be obtained as the difference between total uses and total resources below the line. In economic terms, this shows that disposable income must be identical with the sum of the final consumption expenditures and net acquisitions of non-financial and financial assets plus any capital transfers made minus any received. No balancing item appears in this identity. Disposable income has to disposed of one way or another in transactions, even if unspent income is merely used passively to accumulate financial assets in the form currency and deposits. The identity between disposable income and the sum of consumption, net acquisitions of assets and net capital transfers is utilised extensively in Chapter 7 below.

Any of the SNA's balancing items can be obtained by working up from the bottom of the integrated transactions account instead of working down from the top. This is obvious in the case of *net lending/borrowing* which can be obtained directly as the balancing item of the financial account even if none of the other accounts are compiled. However, by compiling the capital account as well as the financial account the next balancing item in the ascending order of transactions accounts, that of the use of income account, saving, can be estimated directly, and so on. These relationships underline the fact that the transactions accounts comprise a well defined, interdependent system of accounts.

### Non-monetary transactions in the transactions accounts

The internal consistency and coherence of the set of transactions accounts is not affected by the recording of non-monetary transactions for which values have to be imputed. This follows because the double entry principle must be respected for these transactions in the same way as for monetary transactions. Whenever a value is imputed for a resource (use) an equal value must be imputed for the corresponding use (resource) by the unit concerned in one or other of the transactions accounts. This applies both to barter transactions with two parties for which four entries of equal value must be recorded in the transactions accounts and to internal transactions for which only two entries are needed. None of the identities described in the previous paragraphs are disturbed by the inclusion of imputed values within the system.

In general, non-monetary transactions have no effect on *net lending/borrowing*. Exceptionally, however, non-monetary financial assets such as securities or shares could be transferred or bartered against goods, services or non-financial assets, in which case *net lending/borrowing* would be affected by including their imputed values in the accounts. Barter transactions which are not completed within the day also give rise to payables and receivables in kind whose values have to be recorded in the financial account and therefore also affect *net lending/borrowing*. The accounting treatment of these barter transactions, which may become important under high inflation, is explained in detail below.

## ALTERNATIVE ACCOUNTING PROCEDURES UNDER HIGH INFLATION

The integrated transactions accounts can be used to examine the consequences of adopting alternative accounting procedures under high inflation. Two examples will be considered here. The first is the possibility of recording real interest rather than nominal interest. The second is the possibility of broadening the concept of income to include real holding gains and losses.

**The treatment of interest**

As explained in more detail in Chapter 7, under conditions of high inflation creditors may secure compensation for the real holding losses that they incur on their loans by increasing their interest charges. They may do this by index linking the interest or principal of the loans or simply by charging appropriately high rates of nominal interest. It is proposed in this manual that the economic reality of these arrangements should be recognised by partitioning receipts of nominal interest into two components, one of which denotes the receipt of compensation for the creditor's real holding loss and the remainder real interest. The receipt of compensation is recorded as a form of capital transfer in the capital account instead of as property income in the allocation of primary income account. The implications of this change in the treatment of interest can easily be inferred from Table 2.1. Under the 1993 SNA, the whole of the creditor's interest receipts are recorded under item D.4 in the resources column of the allocation of primary income account. Under the alternative treatment, part of these receipts are transferred to be recorded lower down in the same column under item D.9 in the capital account. Obviously, this leaves total resources unchanged and does not disturb the balance between total resources and uses. The only balancing items affected are those for the allocation of primary income account, the secondary distribution of income account and the use of income account which are all reduced by the amount of the compensation payable. The balancing items of the capital and financial accounts are obviously unchanged. The objective of obtaining improved measures of income and saving that are both more meaningful economically and likely to be superior for analytical purposes is achieved simply with minimal changes to the accounts.

In the case of the debtor, that part of the interest payment that constitutes payment of compensation is similarly transferred from item D.4 in the uses column of the allocation of primary income account to item D.9 in the resources column of the capital account where it is recorded with a minus sign. Total resources and total uses are both reduced by the amount of the compensation payable, but only because, in the 1993 SNA, capital transfers payable are recorded as negative flows in the resources column. The debtor's balance of primary income, disposable income and saving are each increased by the same amount that the creditor's is reduced. If they both belong to the same sector there is no change in any of the balancing items for the sector as a whole. For the total economy, therefore, there is no change in GNI, national disposable income or saving except when either the creditor or the debtor is a non-resident.

**Real holding gains and losses**

It is often suggested, especially when there is high inflation, to broaden the concept of income used in the SNA to include the real holding gains and losses on non-financial and financial assets. The concept of income is discussed more fully in Chapter 7 and only its relationship with holding gains is considered here.

As explained in Chapter XII of the 1993 SNA, a **nominal** holding gain (loss) is the increase (decrease) in the monetary value of an asset, and hence in the monetary net worth of its owner, resulting from an increase (decrease) in its actual or estimated price. A **real** holding gain (loss) is equal to the nominal holding gain (loss) **minus** the neutral holding gain, where the latter is defined as the amount by which the value of an asset has to increase in order merely to keep pace with the general rate of inflation. A real holding gain (loss) accrues when the **relative** price of an asset rises (falls), irrespectively of the general rate of inflation. Nominal holding gains must be zero on monetary assets whose prices do not change, and holders of these assets must incur real holding losses when there is inflation.

It is not feasible to record gains and losses that are not attributable to transactions in a set of transactions accounts based on double entry bookkeeping. Compare, for example, the disposal of an asset by a gift with the loss of the same asset by accident. The gift can be recorded in the capital account of the donor because, when an asset is disposed of through a transaction, there must be a counterpart, which takes the form of a capital transfer in the case of a gift. Conversely, the counterpart to the capital transfer received by the beneficiary is the acquisition of the asset. The four entries in the combined capital accounts of both parties ensure that the balance between total uses and total resources in the set of transactions accounts as a whole is maintained. On the other hand, if the asset is accidentally destroyed

the disposal (loss) cannot be recorded in the capital account because there is no transaction. Double entry bookkeeping requires the use made of the resources realised by disposing of the asset in a transaction to be recorded as the counterpart to the disposal, but there are no resources when the asset is destroyed. Recording the loss on its own would introduce an imbalance between the total resources and total uses in the transactions accounts for the individual concerned and in the set of transactions accounts as a whole. Fundamental accounting identities, such as that between the balancing items of the capital and financial accounts, would no longer hold. In order to preserve the internal consistency of the transactions accounts, the loss must be recorded outside of the set of transactions accounts. The "other" changes in assets "account" was therefore introduced into the 1993 SNA specifically for the purpose of recording gains or losses that do not result from transactions between institutional units. In fact, it is not an account based on double entry bookkeeping but a table in which such gains and losses can be recorded.

Holding gains or losses cannot be recorded in the transactions accounts of the SNA for the same kinds of reasons as accidental losses. Suppose, for example, a real holding gain were to be recorded as a "resource" within one of the income accounts of the SNA. It would then be necessary not merely for there to be a counterpart use but also for that use to be recorded somewhere in the set of transactions accounts. In practice, however, there is no counterpart because there is no "resource" generated by a transaction. There is no other party involved. It is not feasible therefore to record holding gains and losses in a set of transactions accounts based on double entry bookkeeping. They cannot be incorporated within income accounts which form part of a wider set of articulated, coherent and consistent transactions accounts.

Two proposals relating to interest and real holding gains and losses that are commonly made in the context of inflation accounting have just been examined. By utilising the accounting framework provided by the integrated transactions accounts, it has been shown that that the two proposals are radically different in terms of their accounting implications. The treatment of interest can be modified very simply in order to record only real interest as a primary income flow by partitioning an existing transaction and reclassifying one of its components. It has a minimal effect on the accounts. On the other hand, attempting to incorporate real holding gains and losses in the income accounts presents insuperable difficulties from an accounting viewpoint because it is not possible to introduce items that are not transactions into a set of transactions accounts.

*Annex 2.1*

# BARTER TRANSACTIONS WITH TIME LAGS

Certain types of exchange take time to complete. For example, goods may be delivered one day in exchange for other goods to be received on an agreed future date. Under high inflation prices may rise considerably in the intervening period and this complicates the recording of such transactions in the accounts. This annex examines the technical accounting problems created by such "staggered" exchanges drawing on some earlier ideas of Hicks. Exchanges of this kind may become quite important under high inflation as they provide a hedge against inflation for the unit making the initial delivery.

## "LOAN" TRANSACTIONS

Spot transactions are transactions completed the same day. Forward transactions, by mutual agreement between the two contracting parties, are due to be carried out on some future specified day. They are not recorded in the accounts until they actually take place. There is a third type of contract in which the first side of an exchange is carried out one day, the second side being carried out on an agreed future date. As already noted, for national accounts purposes such contracts have to be treated as requiring two separate, but linked, transactions. The simplest example is a loan with a fixed repayment date. The initial lending is the first transaction and the subsequent repayment the second transaction, the lender having a financial claim over the debtor during the intervening period. However, contracts of this kind may take a variety of different forms as, for example, when payments are made in advance, or in arrears, on ordinary purchases of goods or services. Arrangements of this kind were described by Hicks (*op cit*, p. 141) as "loan transactions", the essential feature of a "loan transaction" being that its execution requires two linked, but separate, transactions at different points of time. Hicks pointed out that any kind of "loan transaction", including a staggered barter transaction in which commodities today are exchanged for commodities in the future, is equivalent to a loan combined with a spot transaction and a forward transaction. Barter transactions of this kind provide the "creditor" with a hedge against inflation.

When forward markets exist, goods today may easily be "exchanged" for other goods to be delivered on some future date. For example, coffee could be bartered for oil in the future by selling coffee now, buying oil on the forward market and lending the proceeds from the sale of the coffee over the intervening period. The items traded could equally well be financial assets rather than goods or services. Even currency may be traded for foreign currency. As pointed out by Hicks, the difference between the spot and forward rates of exchange needs to equal the difference between the interest rates in the two money markets if the various markets are to be in equilibrium.

When there is inflation, however, future prices, both absolute and relative, become subject to considerable uncertainty. Forward markets are unlikely to be able to function in these circumstances. In the absence of properly organised forward markets, it becomes more difficult to barter goods or services now for goods and services in the future, although the incentive to barter may actually be increased by uncertainties about future prices under high inflation. Barters have therefore to be arranged individually by the parties concerned instead of by dealing on forward markets.

## ACCOUNTING FOR BARTER TRANSACTIONS WITH TIME LAGS

When one item is bartered for another at the same time, the exchange constitutes a single transaction. The same value is imputed for both items in the accounts. As already explained, however, when the

two sides of an exchange take place on different dates, two separate transactions have to be recorded with one party having a claim over the other in the intervening period. If prices remain unchanged, both items are recorded at the same value in the same way as for a simultaneous barter. However, when the price of the second item rises significantly before it is exchanged, the entries associated with the two transactions cannot have the same values. In the SNA, goods involved in transactions must always be valued at their actual transaction prices or at their estimated average market prices at the time. In order to reconcile the different values at which the two items exchanged are recorded, it is necessary to recognise that the claim of the first party over the second in the period intervening between the two transactions is a claim "in kind" whose value is not fixed in money terms. The monetary value of this claim increases in proportion to the increase the price of the good, service or asset to be delivered in the second transaction. In effect, the monetary value of the claim is index linked to the price of the latter.

The accounting treatment has therefore to be the same as that for a index linked loan as described in Chapter 5. The increase in the monetary value of the claim is recorded as additional lending in the financial accounts of both parties. It is financed out of compensation of equal monetary value payable by the second party to the first. The nominal net worth of the first party increases as a result of holding a claim in kind during inflation, while that of the second party is reduced by incurring a liability in kind. The changes in their real net worth, however, depend on the change in the *relative* price of the item to be delivered in the second transaction.

Holding a claim in kind entitling the holder to take delivery of some item on a future date must be distinguished from holding (*i.e.*,actually owning) that item over a period of time. In the latter case, a nominal holding gain accrues to the owner and no transaction involving another unit takes place. In the former case, no nominal holding gain accrues to the holder of the claim. Instead, the holder of the claim is compensated by the other party for the nominal holding gain that would have accrued if the item itself had been owned instead of the claim. Supposing the second unit, the "debtor", actually owns the item over the period of time between the two transactions, the nominal holding gain which accrues to the "debtor" is counterbalanced by the compensation payable to the holder of the claim under the terms of the contract between them. In effect, the nominal holding gain is transferred to the holder of the claim who receives compensation of equal monetary value as a result of the contract between them. The nominal holding gain can accrue to only one of the two units as only one of them is the actual owner of the good or asset at any given moment of time.

Table 2.1 **SNA transactions accounts**
Total economy
(1993 SNA Illustrative Data)

| SNA code | Uses | | SNA code | Resources | |
|---|---|---|---|---|---|
| | | Production account | | | |
| P.2 | Intermediate consumption | 1 883 | P.1 | Output | 3 604 |
| K.1 | Consumption of xed capital | 222 | D.21 – D.31 | Taxes less subsidies on products | 133 |
| B.1n/B.1* n | *Value added, net/Net domestic product* | 1 632 | | | |
| | | Generation of income account | | | |
| D.1 | Compensation of employees | 762 | B.1n/B.1* n | *Value added, net/Net domestic product* | 1 632 |
| D.2 – D.3 | Taxes less subsidies on production and imports | 191 | | | |
| B.3n + B.2n | *Mixed income + operating surplus, net* | 679 | | | |
| | | Allocation of primary income account | | | |
| | | | B.3n + B.2n | *Mixed income + operating surplus, net* | 679 |
| | | | D.1 | Compensation of employees | 766 |
| | | | D.2 – D.3 | Taxes less subsidies on production and imports | 191 |
| D.4 | Property income | 391 | D.4 | Property income | 416 |
| B.5n/B.5* n | *Balance of primary incomes, net/Net national income* | 1 661 | | | |
| | | Secondary distribution of income account | | | |
| | | | B.5n/B.5* n | *Balance of primary incomes, net/Net national income* | 1 661 |
| D.5 + D.6 + D.7 | Current transfers, payable | 1 135 | D.5 + D.6 + D.7 | Current transfers, receivable | 1 106 |
| B.6n | *Disposable income, net* | 1 632 | | | |
| | | Use of income account | | | |
| P.3 | Final consumption expenditure | 1 399 | B.6n | *Disposable income, net* | 1 632 |
| D.8 | Adjustment for the change in net equity of households in pension funds | 11 | D.8 | Adjustment for the change in net equity of households in pension funds | 11 |
| B.8n | *Saving, net* | 233 | | | |
| | | Capital account | | | |
| P.5 + K.2 | Acquisitions less disposals of non-nancial assets | 414 | B.8n | *Saving, net* | 233 |
| | | | D.9 | Capital transfers receivable **minus** capital transfers payable | –3 |
| K.1 | **Minus** consumption of xed capital | –222 | | | |
| B.9 | *Net lending (+)/Net borrowing (–)* | 38 | | | |
| | | Financial account | | | |
| F.1 to F.7 | Net acquisition of nancial assets | 641 | B.9 | *Net lending (+)/Net borrowing (–)* | 38 |
| | | | F.2 to F.7 | Net incurrence of liabilities | 603 |
| | TOTAL USES | 6 827 | | TOTAL RESOURCES | 6 827 |

Table 2 2 **Integrated SNA transactions account**
Total economy
(1993 SNA Illustrative Data)

| SNA code | Uses | | SNA code | Resources | |
|---|---|---|---|---|---|
| P 2 | Intermediate consumption | 1 883 | P 1 | Output | 3 604 |
| K 1 | Consumption of xed capital | 222 | D 21 – D 31 | Taxes less subsidies on products | 133 |
| D 1 | Compensation of employees | 762 | D 1 | Compensation of employees | 766 |
| D 2 – D 3 | Taxes less subsidies on production and imports | 191 | D 2 – D 3 | Taxes less subsidies on production and imports | 191 |
| D 4 | Property income | 391 | D 4 | Property income | 416 |
| D 5 + D 6 + D 7 | Current transfers, payable | 1 135 | D 5 + D 6 + D 7 | Current transfers, receivable | 1 106 |
| P 3 | Final consumption expenditure | 1 399 | | | |
| D 8 | Adjustment for the change in net equity of households in pension funds | 11 | D 8 | Adjustment for the change in net equity of households in pension funds | 11 |
| P 5 + K 2 | Acquisitions less disposals of non-nancial assets | 414 | D 9 | Capital transfers receivable **minus** capital transfers payable | –3 |
| K 1 | **Minus** consumption of xed capital | –222 | | | |
| F 1 to F 7 | Net acquisition of nancial assets | 641 | F 2 to F 7 | Net incurrence of liabilities | 603 |
| F 2 + F 7 | *Of which* net acquisition of monetary assets | 180 | F 7 | *Of which* net acquisition of monetary liabilities | 184 |
| | TOTAL USES | 6 827 | | TOTAL RESOURCES | 6 827 |

# 3. CONSTANT PRICE LEVEL, OR CPL, ACCOUNTS

## INTRODUCTION

The objective of this chapter is to examine how the current accounts of the SNA need to be modified in order to enhance their analytic and policy relevance under conditions of high inflation. It is not concerned with specific issues affecting individual items in the accounts, such as the treatment of interest or indexed loans.

The accounts are designed to record various economic activities such as the production of goods and services, income generation and distribution, consumption and capital accumulation. The accounting rules of the system are framed in such a way that these activities are recorded in economically appropriate ways at the times the activities take place. Two fundamental general accounting rules are that:

1. transactions are recorded at the time they take place, and
2. the goods and services involved in transactions are recorded at their actual transaction prices or, in the case of flows for which values have to be imputed, at the estimated average market prices at the times the transactions take place.

These accounting rules are robust in the sense that, by observing them, each activity is correctly measured at the time it takes place, no matter how high the rate of inflation (see para. 19.70 of the 1993 SNA). However, they do not address the quite different question of how to record in a consistent manner within the same accounting period different activities taking place at different times when the general price level is increasing rapidly.

Suppose the rate of inflation is such that the general price level in the fourth quarter of the year is three times higher than in the first quarter. If the accounts for each of the four quarters of the year are simply added together to obtain the annual accounts, activities taking place in the fourth quarter receive three times the weight of similar activities taking place in the first quarter. The annual accounts will tend to be increasingly dominated by activities taking place towards the end of the year the faster the rate of inflation. To the extent that the pattern of economic activities varies from quarter to quarter the annual accounts obtained by simple addition will tend to present an unbalanced, distorted picture of the year as a whole. Suppose, for example, that a productive activity gradually becomes less and less profitable during the course of the year. The annual account for that activity will make it appear much less profitable for the year as a whole than it was most of the time by giving a disproportionately large weight to the transactions recorded towards the end of the year. A numerical example of this kind of distortion is given later in the chapter.

It is necessary therefore to re-examine the economic principles underlying the process of aggregation by which the annual accounts are constructed. Simple addition of the the values of flows occurring at different points of time throughout the accounting period as a whole may not necessarily produce the most meaningful and useful annual accounts under conditions of high inflation.

## AGGREGATION OVER GOODS AND SERVICES AND OVER INTERVALS OF TIME

The economic theory underlying the aggregation of the values of different kinds of goods and services is that relative prices should reflect both relative costs of production and relative utilities to users, whether producers or consumers. Market forces may be expected to ensure that relative prices do not diverge very much from these underlying ratios at any given point of time. When there is high inflation,

however, the ratio of the price of a given good or service at a later point of time to its price earlier in the same accounting period may simply reflect the general rate of inflation and have nothing to do with relative costs or utilities.

When accounts are compiled by aggregating over both commodities and time, the relative prices of the same commodity at different points of time within the accounting period are treated in the same way as the relative prices of different commodities on the market at the same time. From an economic point of view, quantities of goods or services sold at higher prices later in the accounting period as a result of high inflation are therefore implicitly treated as if they were superior qualities of the same goods and services sold earlier in the period. The accounts are incapable of distinguishing inter-temporal relative prices for the same commodity from inter-commodity relative prices at the same point of time even though their economic significance is totally different.

Under high inflation, the monetary values of flows of goods and services at different points of time within the same accounting period are not commensurate with each other because the unit of currency used as the *numéraire* is not stable. Adding together different quantities of the same good valued at different prices is equivalent, from a scientific point of view, to using different units of measurement for different sets of observations on the same variable. In the case of physical data, however, it is rather more obvious that adding quantities measured in grams to quantities measured in ounces is a futile procedure. An economically equivalent procedure would be to add quantities valued in US dollars to quantities valued in French or Belgian francs. Even when countries use the same name for their currency unit, *e.g.*, the dollar, adding values expressed in different kinds of dollars, such US, Australian or Singapore dollars, produces economically useless totals if the purchasing power of the "dollar" is not the same in each country. However, the difference in purchasing power between two different kinds of dollars at the same moment of time may be considerably less than the difference in purchasing power of a single currency unit between two different points of time within the same accounting period under high inflation.

To have meaningful and analytically useful accounts, it is necessary to employ as *numéraire* a unit of currency that remains stable throughout the accounting period as a whole. This can be achieved by deflating the monetary values of the flows in each successive sub-period (quarter, month or week) by a general price index based on some convenient reference point, such as the beginning, middle or end of the accounting period. By converting the flows in this way so that they are all expressed at the same general price level, any remaining price changes within the period must be changes in relative prices that are attributable to changes in real demand or supply conditions. In this respect, the deflated accounts are no different from actual accounts compiled under zero inflation. Even when there is no inflation changes in relative prices may be expected to occur in response to changes in relative costs of production or changes in user preferences.

It will be shown in the following chapter that in order to compile annual price and quantity indices that satisfy the standard axioms of index number theory under conditions of high inflation it is also necessary, as a preliminary step in the calculations, to deflate the values of the flows in each successive sub-period by a general price index so that price and quantity observations are equally weighted throughout the year. Without this adjustment it is not possible to decompose the year to year changes in the values in the annual accounts into price and quantity indices, both of which satisfy the standard criteria for index numbers. The fact that the original unadjusted accounts cannot be satisfactorily factored into price and quantity components is by no means obvious intuitively. The underlying problem is that, in the unadjusted accounts, inter-temporal price relatives for the same commodity are treated in exactly the same way as inter-commodity price relatives at the same moment of time, even though the former reflect price changes while the latter reflect quantity differences. From an index number point of view the aggregate values in the original accounts can be seen to be internally inconsistent.

## ACCOUNTS AND INTER-TEMPORAL RESOURCE ALLOCATION

The need to deflate values in successive sub-periods by a general price index is also supported by the economic theory of inter-temporal resource allocation. In order to draw up optimal production or consumption plans covering a succession of time periods, economic theory requires the values of flows

occurring in later periods to be discounted to the point of time at which decisions have to be taken by using an appropriate rate of interest. Discounting makes the values of flows in different time periods economically equivalent for decision taking purposes. When there is no inflation, nominal interest rates are typically only a few per cent per year so that discounting only begins to have a significant effect for flows spaced out over a number of years. Discounting flows for different quarters or months within a single year would be superfluous as it would have a negligible effect when interest rates are very low.

However, if prices double or treble within the space of a year, nominal interest rates can be expected to rise correspondingly to one or two hundred per cent per year. Indeed, the indexation of loans, as tends to happen under high inflation, more or less guarantees that nominal interest rates will rise to match the general rate of inflation. Under these circumstances, the values of flows occurring in successive months, must be discounted to a fixed point of time, such as the beginning of the year, if production or consumption plans are to be formulated and executed in an optimal fashion. The month on month nominal interest rates under high inflation may actually be significantly larger than the year on year interest rates when there is no inflation. The nominal interest charges incurred on short term loans raised to finance the holding of inventories over a period of several months may well exceed the initial cost of the inventories when inflation is running at 200 per cent or more per year.

When nominal interest rates reach these orders of magnitude, monthly rates of interest will tend to approximate closely to the rate of inflation, especially as the indexation of loans becomes prevalent. Real interest rates may be expected to be very small compared with both the nominal rates and the rates of inflation. In these circumstances, discounting the values of flows in successive months to the beginning of the year will be more or less equivalent to deflating them by a general price index based on the beginning of the year. Thus, converting the accounts so that flows in successive months are all measured at the same general price level can be viewed as an alternative to discounting, as both procedures may be expected to yield very similar results in practice under conditions of high inflation. The resulting accounts provide information that is much more relevant and appropriate for decision taking and policy making.

Deflating may therefore be regarded as a proxy for discounting under conditions of high inflation. The justification for deflating advanced in the previous section relied on the economic principles underlying the aggregation of the values of different kinds of goods and services. Discounting, however, is appropriate not merely for flows of goods and services but also for income flows and balancing items such as the operating surplus or disposable income. Under high inflation the entire set of accounts for each successive sub-period needs to be deflated so that each set uses the same stable unit of currency as *numéraire*. As shown later in this chapter, it also useful to express the opening and closing balance sheets for the year at the same general price level as the flow accounts.

## CONSTANT PRICE LEVEL ACCOUNTS

The conclusion emerging from the two previous sections is that under conditions of high inflation the accounting year should be divided into short sub-periods, such as quarters or months, in which the increase in the general price level is negligible, or at least very small compared with the increase over the year as a whole. The entire set of accounts for each sub-period should then be divided by a general price index based on some convenient point of time such as the beginning, middle or end of the year. The resulting accounts are described here as constant price level, or CPL, accounts although they could equally well be described as constant purchasing power accounts. The CPL accounts for the year as a whole are obtained simply by adding together the CPL accounts for the sub-periods. As the price level in each sub-period is the same, the accounts for each sub-period receive equal weight in the annual accounts, in contrast to the original unadjusted accounts which tend to be heavily dominated by activities taking place towards the end of the year under conditions of high inflation.

Two points may be noted about CPL accounts. First, the compilation of CPL accounts requires standard SNA accounts for the various sub-periods as inputs into their calculation. As already noted, the accounting rules of the SNA are robust and enable economic activities to be correctly recorded at the times they take place, no matter how high the rate of inflation. The CPL accounts are designed for purposes of aggregating in an economically appropriate way the SNA accounts for the different

sub-periods of a single accounting period when the general price level varies significantly from sub-period to sub-period. The CPL accounts are therefore fully consistent with the SNA. They are an extension of the SNA and not a departure from it.

Second, the CPL accounts are very easy to calculate as they simply involve scaling up or down the entire set of accounts for each individual sub-period by dividing through by a constant. The scalar is given by a general price index based on some convenient time point within the accounting period. The calculation of a set of CPL accounts for a single year requires a short term price index for each of the sub-periods within the year. No price comparisons with other years are involved. The accounts should also not be confused with accounts at constant prices in which each individual flow is revalued at its own price in some base period.

It is clear that CPL accounts should normally be compiled as a supplement to conventional economic, and business, accounts under conditions of high inflation. They can be calculated quickly and at little extra cost, assuming that accounts are already available for sub-periods and not only for the year as a whole. Accounts for time periods which are as short as possible are needed in any case when there is high inflation.

Adjusting the current values of flows (or stocks) in different sub-periods for changes in the general price level is an intuitively obvious way of making them more comparable under high inflation. It seems that an adjustment of this general type is frequently used in countries actually experiencing high inflation: for example, in Israel during the 1980s. The method is also advocated in a paper by Seruzier (1989) where the resulting CPL accounts are described as "calibrated" accounts. The possibility of adjusting certain flows or aggregates by a general price index is also mentioned in paragraph 19.76 of the 1993 SNA, although the systematic calculation of CPL accounts is not recommended there.

Most of the rest of this chapter is devoted to explaining the properties of CPL accounts and how they relate to conventional current and constant price SNA accounts. A numerical example using quarterly data is employed to illustrate in a concrete way how the different types of accounts may differ from each other. In order to throw the differences into sharp relief the following high rate of inflation is assumed:

| | 1st Q | 2nd Q | Mid-year | 3rd Q | 4th Q |
|---|---|---|---|---|---|
| General Price Index | 60 | 0.75 | 1 | 1.25 | 2.5 |

The values of the indices are assumed to be averages of the 13 weekly indices for each quarter, the indices being based on the middle of the year. In order to illustrate the consequences for the entire system of accounts, including major balancing items, the compact integrated SNA transactions account explained in Chapter 2 is used.

## REDUCING PRICE VARIATION BY SHORTENING THE ACCOUNTING PERIOD

CPL accounts require accounts for short sub-periods – preferably months but certainly no longer than quarters. In any case, shortening the accounting period below a year is the only way to reduce the amount of price varation within the basic accounting data to an acceptable minimum under conditions of high inflation, whether or not it is proposed to go on to compile CPL accounts for the year as a whole (see paragraph 19.77 of the 1993 SNA). Whereas an annual rate of inflation of 200 per cent, for example, makes conventional annual accounts at current prices of limited usefulness, this rate is equivalent to a quarterly rate of only 32 per cent which may make quarterly accounts acceptable. Superficially, it may appear that the simple solution to high inflation is keep shortening the accounting period until inflation within the accounting period is contained within acceptable limits and no further adjustments are needed to the basic accounting data. In practice, however, there is inevitably a trade off between shortening the accounting period and the costs and the reliability of the ensuing accounts. There are also additional practical and conceptual difficulties involved in compiling accounts for short time periods. In order to keep these issues in perspective, it is useful to summarise the problems created by continually shortening the accounting period.

1. The compilation of accounts for shorter time periods requires more information about the times at which various transactions take place. Enquiries may have to be conducted more frequently thereby creating additional costs for the data collectors. More burdens are also placed on the

respondents supplying the information. In many cases, they may be unable to supply the necessary information because their own internal records and accounts do not permit them to do so, especially when they traditionally report their accounts for longer time periods, such as a year.

2. As production is a process which can extend over a considerable period of time its measurement becomes progressively more difficult the shorter the accounting period. The problem is not confined to agriculture or forestry where many production processes take a year or more. The production of large fixed assets such as large ships, bridges, power stations, dams or the like can extend over several years. The output produced over shorter periods of time then has to be measured on the basis of the work in progress completed each period. As explained in the 1993 SNA, paragraphs 6.72 to 6.79, the measurement of work in progress in industries such as agriculture and construction is difficult enough when prices are stable. It becomes even more difficult when prices are rising rapidly. In these circumstances the correct matching of inputs to outputs required by the measurement of value added poses severe practical problems. Without satisfactory measures of value added for many major industries it is obviously difficult to measure GDP satisfactorily from the output side. On the other hand, the measurement of final expenditures over short periods of time does not pose quite the same problems, at least for flows such as household final expenditures, exports and imports.
3. Because many transactions, especially large transactions, are not completed within the day there are typically many receivables and payables outstanding at any given moment of time. They assume greater importance in relation to the flows as the accounting period is reduced. This makes it more difficult to reconcile the values of different flows in the accounts, especially if the two parties to a transaction perceive it as taking place at different times from each other and do not record it in the way required by the system. This is likely to happen when transactions are completed in stages with time lags between placing orders, sending invoices, writing cheques, clearing cheques, etc. Other lags may occur between the despatch of goods and their receipt. While the SNA provides rules for dealing with these lags they may not be respected in practice. Failure to observe the system's rules for the recording of transactions will introduce inconsistencies between different flows in the accounts: for example, between imports, exports and production or between entries in the non-financial and financial accounts. These inconsistencies may make the compilation of complete sets of accounts a practical impossibility for very short periods of time.

Thus, while accounts may have to compiled quarterly, or even monthly, under high inflation, they do not provide an easy solution to the problem. On the contrary, having to compile accounts more frequently as a result of high inflation is obviously more costly for both the respondents supplying the information and the statistical agencies producing the accounts. The agencies may not have the resources, either financial or human, to conduct additional enquiries, while the respondents may not keep the necessary information on record. The quality and reliability of the accounts is likely to deteriorate as their frequency is increased and it may become progressively more difficult to reconcile data both within an account and between different accounts. In particular, the reliability of the balancing items, whose calculation is one of the main reasons for compiling accounts, may suffer as they are sensitive to the errors in all the other items in the accounts. Finally, the number of accounts which it is feasible to compile may have to be greatly reduced. Experience shows that even countries whose statistical offices may be relatively well endowed with resources and which may not have to cope with problems of high inflation typically produce far fewer quarterly than annual national accounts. Accounts compiled on a monthly basis tend to be even rarer. Despite these practical difficulties, however, the calculation of a basic set of quarterly accounts has to be the first priority under high inflation.

## A NUMERICAL EXAMPLE OF CPL ACCOUNTS

In order to illustrate the relationship between CPL accounts and the corresponding unadjusted current accounts, it is useful to examine a numerical example based on the transactions accounts for the total economy. As explained in Chapter 2 above, this sequence of accounts forms a complete, closed and interdependent set of accounts. In the following example, illustrative numerical data drawn from

the 1993 SNA have been modifed slightly in order to change two of the balancing items, namely net saving and net lending/borrowing, from positive to negative. The new data are given in the first of the two columns in Table 3.1 under the heading "original". These same data are also given in more compact form in the column headed "year total" in the integrated transaction account shown in Table 3.2. In this table, the data have also been distributed over the four quarters of the year by assuming that they increase roughly in proportion to the increase in the general price index shown above. However, some structural changes are also built in. Some slowing down of productive activity is assumed towards the end of the year and also some increase in the ratio of final expenditures to income.

The simulated quarterly accounts are then rescaled by dividing all the quarterly data in each column by the general price index for that quarter given above: for example, all the figures for the first quarter are divided by 0.5. The resulting CPL data, together with the new annual totals derived from them, are given in Table 3.3. Finally, the annual CPL figures are transferred back to the second column of Table 3.1 so that they can be directly compared with the original current accounts. The values in the CPL annual accounts happen to be somewhat lower than the orginal figures because the mid-year price level chosen for the CPL accounts is less than the average price level for the year as a whole when prices are rising at a constant or accelerating percentage rate. The absolute values of the flows in the CPL accounts can, of course, be varied if desired by choosing the price level at some other point of time.

The final consumption expenditures in Table 3.3 are assumed to rise in real terms from quarter to quarter, despite the slowing down in production and real income, so that the savings ratio falls. Whereas the CPL accounts in Table 3.1 show positive saving for the year of 5.7 per cent of disposable income, the unadjusted annual accounts show a negative saving rate of 7.9 per cent because they give disproportionate weight to the low rates of saving towards the end of the year. By giving equal weight to each of the four quarters, the CPL accounts present quite a different picture of savings behaviour over the year as a whole. Adjusting the accounts also changes the balancing item of the financial account from negative to positive for similar reasons. Just as the saving rate is assumed to fall as inflation accelerates, the rate of lending/borrowing is also assumed to fall, becoming negative towards the end of the year.

It should be noted that in order to preserve the internal consistency of the set of integrated CPL transactions accounts as a whole, the values of the assets whose acquisitions and disposals are recorded in the capital and financial accounts have to be rescaled in the same way as the flows in the production and income accounts. In particular, the monetary assets whose changes are the counterparts to flows recorded elswhere have to be rescaled in the financial accounts. Thus, CPL net lending, the balancing item in the capital and financial accounts, cannot be identified with the actual net lending over the year as a whole. It measures net lending expressed in terms of currency of fixed purchasing power equal to that in the middle of the year. In terms of its command over real resources, net lending in the earlier parts of the year was actually worth more than net lending of equal monetary value in the later parts of the year. Actual net lending in the first two quarters has therefore to be appropriately scaled up to obtain the equivalent monetary value of the lending needed at mid-year prices, while that in the last two quarters has to be scaled down. In the numerical example, the net lending of 62 in the first quarter was about three times greater in real terms than the net borrowing of 112 in the fourth quarter, by which time the general price level had risen to five times its earlier level. On balance, the real net lending for the year in the CPL accounts is positive, even though net lending is negative in the unadjusted current accounts. In this way, the CPL accounts throw additional light on lending activities over the year as a whole. The treatment of assets in the CPL accounts is considered further in the section on CPL balance sheets below.

Thus, the CPL accounts can present a rather different, and more balanced, picture of the economic activities taking place during the year as a whole when their patterns are changing. As the unadjusted annual and quarterly current accounts are required and likely to be published in any event, the CPL accounts should be viewed as supplementing, rather than replacing, them. The CPL accounts provide valuable additional information to analysts and policy makers at almost no extra cost. Users need to be aware of the extent to which the original current accounts may be dominated by activities and transactions taking place towards the end of the year.

## ALTERNATIVE PRICE LEVELS

In the CPL accounts described above, the price level chosen was the mid-year level. This is a natural choice for purposes of comparisons with the original current price accounts even though mid-year prices may not be the same as the average prices for the year, as already noted. An alternative strategy would be to utilise the most recent price level, even if this means moving the price level forward each time a new set of data becomes available. As accounts based on earlier prices become rapidly out of date under high inflation users may prefer to have the accounts expressed at the price level of the most recent sub-period possible. The price level for the cumulative quarterly accounts for each year can be moved forward as each new quarter's data become available. The final accounts for the year as a whole would then be at the price level of the fourth quarter.

Switching the price level merely involves multiplying the entire accounts for an individual quarter by the appropriate scalar. For example, to shift the accounts for the first three quarters from the third to the fourth quarter price level, they simply have to be increased in proportion to the increase in the general price index between the third and fourth quarters. It would also be possible to shift to the end year price level, if desired.

CPL accounts impose a stable *numéraire* by keeping the general purchasing power of the currency unit constant throughout the accounting period. In effect, the CPL accounts hold constant the "collective price" of the basket of goods and services covered by the general price index, the collective price being the total value of the basket expressed in terms of the *numéraire* currency unit. A more stringent way to impose stability on the numeraire currency under high inflation is to hold the price of every individual good or service constant throughout the period. This solution is examined in the next section.

## ACCOUNTS AT CONSTANT INTRA-PERIOD PRICES, OR CIP ACCOUNTS

To avoid confusion with the CPL accounts, accounts in which the quantities in each sub-period are valued at a constant set of prices occurring at some point within the accounting period will be described as constant intra-period price, or CIP, accounts. Whereas a complete system of CPL accounts, including the balance sheets, can be compiled because only a single price deflator is required for the entire set of accounts, CIP accounts can only be calculated for accounts containing flows of goods and services and a few other flows, such as compensation of employees and taxes on products for which it is possible to identify units of quantity and associated prices. In practice, flows that can be factored into their own price and quantity components are mostly confined to the supply and use tables of the SNA. This means that the calculation of CIP sector accounts cannot proceed beyond the primary distribution of income account.

CPL and CIP accounts can be used in combination to analyse the redistributive effects of inflation. In order to see how the two sets of accounts differ, it is convenient to assume that they are both based on the prices, or price level, of the fourth quarter. The difference between the CIP and the CPL values for a particular flow for the year will depend on two factors:

1. the magnitude of the cumulative change in the **relative** price of the individual good or service in question between the first and fourth quarters;
2. the timing and frequency of the price changes for the item during the course of the year.

When all prices change at a steady rate throughout the year, the ratio of the CIP figure to the CPL figure depends only on the first factor, the cumulative relative price change. However, when prices do not change at a steady rate, the relationship is more complicated because, whereas the CPL figures (in common with the current price figures from which they are derived) depend on the timing of the price changes, the CIP figures do not. When 4th quarter prices are used for the calculations, the earlier in the year a relative price increase (decrease) occurs, the lower (higher) the ratio of the CIP to the CPL figure will be. These ratios also depend on which quarter's prices are chosen to calculate the CIP and CPL figures.

The differences between the CIP and the CPL figures throw light upon the differential impact of inflation on different groups within the economy, whether producers or consumers. The differences are important economically, socially and politically. Evidence from a number of countries suggests that as inflation accelerates towards high, or hyper, inflation, relative prices also become increasingly unstable. If some prices are "sticky" and are not able to adjust quickly to the overall rate of inflation, relative

prices may change substantially in both the short and the long term. Even if the cumulative price change for an individual item does not diverge much from the general rate of inflation over the long term, it may do so in the short term. The failure of the prices of individual items to adjust quickly to the general rate of inflation will be reflected in the differences between their annual CIP and CPL values.

In the case of a producer, the differences between the CIP and CPL values of output, inputs and value added reflect the producer's trading gains or losses. They are analysed in more detail in Chapter 6 on the production account. In the case of households, the most important factor is the extent and the timing of the adjustments to wages and salaries under high inflation. It is possible to calculate "trading" gains or losses not only for labour but also for recipients of other primary incomes such as rents.

Under high inflation, it is common for wage rates to be index linked. There may be full indexation so that wage rates increase in the same proportion as the index or there may be partial or even over-indexation. Whatever form of indexation is used, it is not likely to be continuous and instantaneous. The more the adjustment of wages and salaries lags behind the increase in the general price index, the more the CIP value, *i.e.*, the constant wage value, is likely to fall short of the CPL value. Because of such lags, even full indexation does not provide complete protection against inflation as the real value of wages is eroded in the interval between one adjustment and the next. The difference between the constant wage rate value of compensation of employees and its CPL value will capture the real losses (or gains) resulting from both the under or over indexation of wage rates and the effects of time lags in implementing the indexation. Compiling both the CIP and the CPL values therefore provides valuable information about not only about the direction but also the magnitude of the redistributive effects of high inflation.

Trading gains or losses, like price and volume measures, are typically calculated between two different periods of time. In the present context, the gains or losses are those occurring within a single accounting period, typically a year, as a result of rapid changes in prices within that period.

**CONSTANT PRICE LEVEL BALANCE SHEETS**

Assume that the flows in the CPL accounts are valued at the general price level in the middle of the accounting period, as in Tables 3.1 and 3.2. In order to value the balance sheets consistently with the CPL flow accounts, the values of the assets and liabilities in the opening balance sheet have to be increased in proportion to the increase in the general price index between the beginning and the middle of the year, while the values in the closing balance sheet have to be reduced in proportion to the increase in the index between the middle and the end of the year.

Neutral holding gains must be zero if the general price level is held constant. Any change between the price at which a given asset is valued in two successive CPL balance sheets must reflect a relative change and give rise to a real holding gain or loss. In contrast to the original current accounts where three kinds of holding gains – nominal, neutral and real – have to be distinguished, only real holding gains or losses occur in CPL accounts. Consider, for example, the recording of a loan of fixed monetary value. Its value is scaled up in the opening CPL balance sheet and scaled down in the closing balance sheet so that its CPL value falls between the beginning and the end of the period in proportion to the increase in the general price level. Over time, the CPL balance sheets display the real holding losses on monetary assets explicitly.

The fundamental accounting identity linking entries in the opening and closing balance sheets, as explained in paragraphs 10.15 to 10.18 and 12.85 to 12.87 of the 1993 SNA, must be rewritten in the following way for CPL accounts:

The CPL value of the stock of the asset in the opening balance sheet

**plus** the value of the quantities of the asset acquired, or disposed of, as recorded in the CPL transactions accounts
**plus** the CPL value of other volume changes in the asset
**plus** the value of the **real** holding gains on the asset
**equals** the CPL value of the stock of the asset in the closing balance sheet.

Entries in the other volume changes in assets account, if any, must be scaled to the mid year price level in the same way as entries in the transactions accounts.

Of the five items in the above identity only four are independent. The value of any one of them may therefore be derived residually from the other four. In the 1993 SNA it is pointed out that it may often be convenient to exploit this identity to estimate holding gains residually even though they are not a balancing item (see paragraphs 12.89 to 12.92, and also paragraphs 11 to 15 of the Annex to Chapter XII). If a full set of CPL accounts is compiled they can be used to estimate real holding gains directly.

**ACCOUNTS IN A FOREIGN CURRENCY**

When there is high inflation it is sometimes suggested that the accounts should be compiled using the currency unit of some other country as *numeraire*. Because of its international importance the US dollar is often chosen for this purpose. Suppose the accounts are available quarterly and are to be expressed in US dollars. The accounts for each sub-period (month or quarter) can be converted into dollars at the average daily exchange rate within that sub-period and the resulting dollar accounts for all the sub-periods added together to obtain the annual accounts in dollars. As conversion into dollars involves multiplying all the flows by a scalar, the exchange rate, from a mathematical point of view the procedure is formally similar to multiplying the accounts for each quarter by the reciprocal of some general price index, also a scalar, to obtain CPL accounts.

If the exchange rate always equalled purchasing power parity, varying continuously in the response to the relative rates of inflation in the country and the United States, converting the accounts into dollars would value the various flows in the same way as if they took place within the United States. The domestic rate of inflation would be replaced by the US rate. In these circumstances, apart from a scalar, the dollar accounts and CPL accounts expressed in domestic currency would differ because of two factors: namely, the rate of domestic inflation within the United States and divergencies between movements in the exchange rate and changes in purchasing power parity. If the objective is to express the accounts of the high inflation country in terms of a stable currency unit, there seems to be no advantage in building the influence of these two destabilising factors into the domestic national accounts of a country. It is simpler, and more effective, to use a completely stable unit, namely its own currency at a particular moment of time; that is, to compile CPL accounts. Converting into a foreign currency such as dollars is only justified therefore if the accounts in dollars are needed for some quite different purpose, such as international comparisons.

International comparisons are made by converting the accounts for different countries into a common *numéraire*, such as the US dollar, by means of exchange rates or purchasing power parities. If the objective is to make comparisons of the volume of GDP or some other aggregate, the accounts in national currencies must be converted using purchasing power parities, as explained in paragraphs 16.87 to 16.104 of the 1993 SNA. However, whether the conversions are made using exchange rates or purchasing power parities, converting the original unadjusted accounts for the year as whole for a high inflation country by the average exchange rate or PPP for the year as a whole is not the optimal way to proceed, given that the annual accounts of high inflation countries are dominated by activities and transactions towards the end of the year. To avoid, or at least minimise, this kind of bias it is better to convert the accounts for individual sub-periods, whether months or quarters, by the average exchange rate or PPP for that sub-period and to obtain the annual figures by adding together the converted figures for the sub-periods. In principle, it would be preferable to make comparisons this way for all countries, but the differences between the results obtained this way and those obtained by converting the annual totals are likely to be so small as not to justify the additional trouble and costs involved except when there is high inflation.

Table 3.1. **SNA transactions accounts**

Total economy

**Original and Constant Mid-Year Price Level Accounts**

| SNA code | Uses | Original | Mid-year price level | SNA code | Resources | Original | Mid-year price level |
|---|---|---|---|---|---|---|---|
| | | | Production account | | | | |
| P.2 | Intermediate consumption | 2 200 | 1 733 | P.1 | Output | 4 000 | 3 260 |
| K.1 | Consumpsion of fixed capital | 250 | 201 | D.21 – D.31 | Taxes less subsidies on products | 150 | 121 |
| B.1n/B.1* n | *Value added, net/Net domestic product* | 1 700 | 1 447 | | | | |
| | | | Generation of income account | | | | |
| D.1 | Compensation of employees | 1 000 | 813 | B.1n/B.1* n | *Value added, net/Net domestic product* | 1 700 | 1 447 |
| D.2 – D.3 | Taxes less subsidies on production and imports | 200 | 160 | | | | |
| B.3n + B.2n | *Mixed income + operating surplus, net* | 500 | 475 | | | | |
| | | | Allocation of primary income account | | | | |
| | | | | B.3n + B.2n | *Mixed income + operating surplus, net* | 500 | 475 |
| | | | | D.1 | Compensation of employees | 1 020 | 839 |
| | | | | D.2 – D.3 | Taxes less subsidies on production and imports | 200 | 160 |
| D.4 | Property income | 500 | 400 | D.4 | Property income | 450 | 371 |
| B.5n/B.5* n | *Balance of primary incomes, net/Net national income* | 1 670 | 1 444 | | | | |
| | | | Secondary distribution of income account | | | | |
| | | | | B.5n/B.5* n | *Balance of primary incomes, net/Net national income* | 1 670 | 1 444 |
| D.5 + D.6 + D.7 | Current transfers, payable | 1 300 | 1 013 | D.5 + D.6 + D.7 | Current transfers, receivable | 1 150 | 932 |
| B.6n | *Disposable income, net* | 1 520 | 1 364 | | | | |
| | | | Use of income account | | | | |
| P.3 | Final consumption expenditure | 1 640 | 1 285 | B.6n | *Disposable income, net* | 1 520 | 1 364 |
| D.8 | Adjustment for the change in net equity of households in pension funds | 10 | 8 | D.8 | Adjustment for the change in net equity of households in pension funds | 10 | 8 |
| B.8n | *Saving, net* | –120 | 78 | | | | |
| | | | Capital account | | | | |
| P.5 + K.2 | Acquisitions less disposals of non-financial assets | 385 | 312 | B.8n | Saving, net | –120 | 78 |
| | | | | D.9 | Capital transfers receivable **minus** capital transfers payable | 50 | 46 |
| K.1 | **Minus** consumption of fixed capital | –250 | –201 | | | | |
| B.9 | *Net lending (+)/Net borrowing (–)* | –205 | 13 | | | | |
| | | | Financial account | | | | |
| F.1 to F.7 | Net acquisition of financial assets | 690 | 570 | B.9 | *Net lending (+)/Net borrowing (–)* | –205 | 13 |
| F.2 to F.7 | Net incurrence of liabilities | 895 | 557 | | | | |
| | TOTAL USES | 7 925 | 6 293 | | TOTAL RESOURCES | 7 925 | 6 293 |

Table 3.2. **Integrated SNA transactions account**
Total economy

| SNA code | Uses | Quarters | | | | Year Total | SNA code | Resources | Quarters | | | | Year Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | | | | 1 | 2 | 3 | 4 | |
| P 2 | Intermediate consumption | 210 | 320 | 545 | 1 125 | 2 200 | P 1 | Output | 415 | 630 | 1 020 | 1 935 | 4 000 |
| K 1 | Consumption of fixed capital | 25 | 38 | 63 | 124 | 250 | D 21 – D 31 | Taxes less subsidies on products | 15 | 23 | 38 | 74 | 150 |
| D 1 | Compensation of employees | 105 | 155 | 250 | 490 | 1 000 | D 1 | Compensation of employees | 108 | 165 | 260 | 487 | 1 020 |
| D 2 – D 3 | Taxes less subsidies on production and imports | 20 | 30 | 50 | 100 | 200 | D 2 – D 3 | Taxes less subsidies on production and imports | 20 | 30 | 50 | 100 | 200 |
| D 4 | Property income | 50 | 75 | 125 | 250 | 500 | D 4 | Property income | 48 | 73 | 115 | 214 | 450 |
| D 5 + D 6 + D 7 | Current transfers, payable | 120 | 185 | 320 | 675 | 1 300 | D 5 + D 6 + D 7 | Current transfers, receivable | 118 | 180 | 288 | 564 | 1 150 |
| P 3 | Final consumption expenditure | 155 | 235 | 405 | 845 | 1 640 | | | | | | | |
| D 8 | Adjustment for the change in net equity of households in pension funds | 1 | 1 | 3 | 5 | 10 | D 8 | Adjustment for the change in net equity of households in pension funds | 1 | 1 | 3 | 5 | 10 |
| P 5 + K 2 | Acquisitions less disposals of non-financial assets | 40 | 60 | 95 | 190 | 385 | D 9 | Capital transfers receivable **minus** capital transfers payable | 7 | 10 | 13 | 20 | 50 |
| K 1 | **Minus** consumption of fixed capital | –25 | –38 | –63 | –124 | –250 | | | | | | | |
| F 1 to F 7 | Net acquisition of financial assets | 75 | 112 | 173 | 330 | 690 | F 2 to F 7 | Net incurrence of liabilities | 44 | 61 | 179 | 611 | 895 |
| | TOTAL USES | 776 | 1 173 | 1 966 | 4 010 | 7 925 | | TOTAL RESOURCES | 776 | 1 173 | 1 966 | 4 010 | 7 925 |

Table 3 3 **Integrated SNA transactions account**
Total economy

**Constant Mid-Year Price Level Accounts**

| SNA code | Uses | Quarters | | | | Year Total | SNA code | Resources | Quarters | | | | Year Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | | | | 1 | 2 | 3 | 4 | |
| P 2 | Intermediate consumption | 420 | 427 | 436 | 450 | 1 733 | P 1 | Output | 830 | 840 | 816 | 774 | 3 260 |
| K 1 | Consumption of fixed capital | 50 | 51 | 50 | 50 | 201 | D 21 – D 31 | Taxes less subsidies on products | 30 | 31 | 30 | 30 | 121 |
| D 1 | Compensation of employees | 210 | 207 | 200 | 196 | 813 | D 1 | Compensation of employees | 216 | 220 | 208 | 195 | 839 |
| D 2 – D 3 | Taxes less subsidies on production and imports | 40 | 40 | 40 | 40 | 160 | D 2 – D 3 | Taxes less subsidies on production and imports | 40 | 40 | 40 | 40 | 160 |
| D 4 | Property income | 100 | 100 | 100 | 100 | 400 | D 4 | Property income | 96 | 97 | 92 | 86 | 371 |
| D 5 + D 6 + D 7 | Current transfers, payable | 240 | 247 | 256 | 270 | 1 013 | D 5 + D 6 + D 7 | Current transfers, receivable | 236 | 240 | 230 | 226 | 932 |
| P 3 | Final consumption expenditure | 310 | 313 | 324 | 338 | 1 285 | | | | | | | |
| D 8 | Adjustment for the change in net equity of households in pension funds | 2 | 1 | 2 | 2 | 8 | D 8 | Adjustment for the change in net equity of households in pension funds | 2 | 1 | 2 | 2 | 8 |
| P 5 + K 2 | Acquisitions less disposals of non-financial assets | 80 | 80 | 76 | 76 | 312 | D 9 | Capital transfers receivable **minus** capital transfers payable | 14 | 13 | 10 | 8 | 46 |
| K 1 | **Minus** consumption of fixed capital | –50 | –51 | –50 | –50 | –201 | | | | | | | |
| F 1 to F 7 | Net acquisition of financial assets | 150 | 149 | 138 | 132 | 570 | F 2 to F 7 | Net incurrence of liabilities | 88 | 81 | 143 | 244 | 557 |
| | TOTAL USES | 1 552 | 1 564 | 1 573 | 1 604 | 6 293 | | TOTAL RESOURCES | 1 552 | 1 564 | 1 573 | 1 604 | 6 293 |

# 4. PRICE AND QUANTITY MEASUREMENT

## INTRODUCTION

Conventional index number theory is concerned with making price and quantity comparisons between **points** of time or space. In national accounts, however, comparisons have to be made between discrete **periods** of time such as months, quarters or years. Significant changes in prices and the flows of quantities may occur not only between different periods but also within a single period of time. When there is high inflation prices may be several times higher at the end of an accounting year than at the beginning. A price comparison between two time periods for a single product does not therefore simply involve the compilation of a price relative based on two individual price observations but a comparison between two different ranges of prices. The nature and significance of such comparisons needs to be clarified, especially as little attention is paid to them in the literature on index numbers.

The fact that prices vary within in the accounting period is the central problem of inflation accounting, even when only a single period is considered. It is appropriate therefore to examine the problems of price and quantity measurement at an early stage in a manual on inflation accounting as they throw into sharp relief some of the fundamental difficulties of interpreting accounts under high inflation.

## PRICE AND QUANTITY COMPARISONS FOR A SINGLE PRODUCT

Before considering aggregate indices, it is necessary to examine how price and quantity measures are to be calculated based on the values of transactions in a single product in two discrete time periods. The product itself is assumed to remain perfectly homogeneous over time so that quantities in different periods or sub-periods may be directly compared or aggregated.

Suppose the accounting period is one year and that it is divided into sub-periods such as weeks, months or quarters. Under high inflation the price of the product may be expected to be rising from sub-period to sub-period so that the total value of the product for period t as a whole may be written as

$$V^t = \sum_j^m p_j^t q_j^t \qquad j = 1, 2, \ldots m \qquad [1]$$

where the summation is over all m sub-periods. It is convenient, and not unreasonable, to assume the price remains constant within each sub-period, provided the sub-periods are short enough. The objective is to split the proportionate change in current values between two complete accounting periods, say years 1 and 2, into its component price and quantity changes.

### Direct quantity measurement

As the quantities refer to a single homogeneous product, the quantity relative is simply the ratio of the total quantities in the two periods. The associated implicit price relative obtained by dividing the ratio of the current values by the quantity relative is the ratio of the quantity weighted arithmetic average prices for the two years: thus,

Implicit price relative $$\frac{V^2}{V^1} \Big/ \frac{\sum_j q_j^2}{\sum q_j^1} = \frac{\sum_j \left(p_j^2 q_j^2\right)}{\sum q_j^2} \Big/ \frac{\sum_j \left(p_j^1 q_j^1\right)}{\sum q_j^1} \qquad [2]$$

This ratio depends upon changes in the quantities and not only the prices and therefore does not satisfy basic index number tests such as the identity and proportionality tests (see Diewert, 1995, pp. 6, 7). In the present context, the identity test requires that if the price in each sub-period in year 2 equals that in year 1 the index should equal unity. The proportionality test generalises this to require that if each sub-period price in year 2 is a constant multiple of that in year 1, the index should equal that constant. The failure to satisfy the proportionality test can be illustrated by means of a numerical example. Consider the price and quantity data for a single homogeneous product, A, given in the first six rows of Table 4.1. The price in each quarter of year 2 is 3 times the price in the corresponding quarter of the previous year, year 1. However, the ratio of the weighted average prices is only 2.49 because the quantity weights for the first two quarters, when prices are relatively low, are much greater in year 2 than year 1.

**Direct price measurement**

Several possible measures of the average price change suggest themselves: in particular, the ratio of the unweighted arithmetic average prices in the two years and the ratio of the weighted arithmetic average prices using the quantities in the sub-periods in one or other of the years as weights.

Consider the "Laspeyres type" price relative defined as the ratio of the weighted averages of the sub-period prices using the first period quantities as weights. The formula is the same as for an aggregate Laspeyres index, except that the quantities all refer to the same homogeneous product.

$$L_P = \sum_J \left(p_J^2 q_J^1\right) \Big/ \sum_J \left(p_J^1 q_J^1\right) \qquad [3]$$

If the ratio of the current values is divided by this measure the derived quantity change is as follows:

$$\frac{V^2}{V^1} \Big/ L_P = \frac{\sum_J \left(p_J^2 q_J^2\right)}{\sum_J \left(p_J^2 q_J^1\right)} \qquad [4]$$

Formula [4] is not an acceptable here as a quantity measure because, in general, it does not coincide with the ratio of the total quantities. Although [4] is the same formula as an aggregate Paasche quantity index, the $q$'s do not refer to different products but to quantities of a single homogeneous product in different sub-periods. Whereas it is appropriate to weight different products, or different qualities, in proportion to their relative market prices at the same point of time, there is no reason to give more weight to some quantities than others in [4] when, by assumption, they are all identical.

In the numerical example just considered, any of the direct price measures proposed above, including [3], would be equal to 3. However, if the ratio of the values for years 2 and 1 is deflated by 3, the resulting implicit quantity relative is 0.83. This is not acceptable when the total quantity of the product is exactly the same in both years. Thus, whether the quantity change or the price change is measured directly, the associated indirect change derived by dividing the ratio of the current values by the direct measure appears to yield unacceptable results.

**Derived or indirect price and quantity measures**

The problems just described stem from the use of current value data as inputs into the calculation of derived or indirect price or quantity measures. As already noted, the principal deficiency of ordinary current accounts under conditions of high inflation is that they permit identical quantities of the same homogeneous product to be valued at very different prices within the same accounting period. Implicitly, quantities of the same product sold at higher prices in the later sub-periods are treated as if they were superior qualities whereas, by definition, they are all identical. This conceptually inappropriate treatment is carried forward into the indirect price or quantity measures derived from changes in current values.

This may be illustrated using the data in the upper part of Table 4.1. Suppose that one unit of quantity is reallocated from the first to the fourth quarter of year 2. As the total quantity in year 2 is unchanged and no price is changed, this shift should have no effect on the price or quantity relatives for

year 2 on year 1. However, as the year 2 value increases by 18 (the difference between the first and fourth quarter prices) the indirect price or quantity relatives derived from the change in values must increase. The indirect relatives can be increased or decreased arbitrarily by reallocating quantities between sub-periods under high inflation, even though both direct relatives remain fixed.

It may be concluded that when there is inflation it is usually not possible to factor changes in the value of flows of goods and services into two complementary price and quantity changes both of which are satisfactory. Whether the direct measure is the price or the quantity change, the indirect measure derived from it generally has unacceptable properties.

Nevertheless, it may happen that under certain circumstances indirect measure are acceptable and it is worth clarifying what these are. It is shown in the Annex to this chapter that a sufficient condition is that the correlations between the sub-period prices and the quantities are the same in both years. This condition is satisfied if prices and the quantities change at steady rates throughout both years, for example, but is bound to be violated when there are fluctations in one of the variables. For example, if inflation continues throughout both periods but there is a peak or trough in real output, indirect price or quantity measures may be very misleading. Reference may be made to the Annex for a proof and further details.

## AGGREGATE PRICE AND QUANTITY INDICES BASED ON CURRENT ACCOUNTS

In the previous section, it was shown that it may be difficult, or even impossible, to partition changes in annual current values into their price and quantity components in a satisfactory way, even at the level of a single homogeous product, when prices are changing within each of the years being compared. In this section, it will be shown that if conventional index number formulae are applied directly to aggregates recorded in current accounts under high inflation, the results are likely to be unacceptable using standard index number criteria. It will also be shown that in some cases improved results may be obtained by modifying the conventional formulae to take account of the fact that they are being applied to discrete time periods. However, even the improved formulae are not optimal. Although the conclusions reached are essentially negative, therefore, it is necessary to establish first why conventional index numbers should not be applied directly to accounts subject to high inflation.

In the final section of the chapter, it will be shown that the best way in which to calculate annual quantity and price indices is to transform the current accounts into CPL accounts prior to calculating the indices. This transformation can be carried out in such a way as to eliminate most of the price variation within each of the years being compared while not affecting the year to year price changes. The transformation tackles the root of the problem.

### The Laspeyres quantity index

Consider the standard formula for a Laspeyres quantity index, namely:

$$L_Q(I) = \sum_i^n \left(p_i^1 q_i^2\right) \Big/ \sum_i^n \left(p_i^1 q_i^1\right) \qquad i = 1, 2, \ldots n \qquad [5]$$

The summation in this expression is over the n goods and services covered by the index and not over sub-periods. When applied to accounting periods under high inflation this formula, called LQ(I), is not operational as it stands because it is not clear what each $p$ stands for. The formula assumes that only single price is associated with the total quantity of each product whereas there may be a whole range of different $p$'s in each of the two years. In order to recognise this, the different $p$'s and $q$'s for the different sub-periods within each year may be separately distinguished from each other and the formula rewritten as follows:

$$L_Q(II) = \sum_i^n \sum_j^m \left(p_{ij}^1 q_{ij}^2\right) \Big/ \sum_i^n \sum_j^m \left(p_{ij}^1 q_{ij}^1\right) \qquad [6]$$

where the summation takes place first over the m different sub-periods of the year and then over the n different products.

With this additional clarification and precision, it might appear that the quantity index defined in [6], called LQ(II), would provide a satisfactory base weighted quantity index for comparing two years in a situation of high inflation. However, LQ(II) makes no distinction between the relative prices of different products in the same sub-period (which reflect quantum differences) and the relative prices of the same product in different sub-periods (which reflect price changes). By failing to recognise this fundamental distinction when there are rapid price changes due to high inflation formula [6] does not provide a satisfactory measure of the aggregate quantity change between two accounting periods. The underlying problem is, of course, the same as that discussed in the previous section, but generalised from a single product to many products.

LQ(II) can be rewritten in a form which makes the underlying difficulties more transparent. Quantities of the same homogeneous product in different sub-periods can be summed to obtain the total quantity of each product for the year as a whole. The average annual price of each product may also be calculated. It is convenient to introduce the following notation for the total quantities and the average prices:

$$Q_i^t = \sum_j q_{ij}^t \qquad \text{and} \qquad \bar{p}_i^{st} = \sum_j p_{ij}^s q_{ij}^t \Big/ \sum_j q_{ij}^t \qquad [7]$$

The first superscript on the average price refers to the year whose prices are being averaged while the second superscript refers to the year whose quantities are used as weights. The Laspeyres quantity index as defined in [6] may now be written as follows:

$$\sum_i \sum_j \left(p_{ij}^1 q_{ij}^2\right) \Big/ \sum_i \sum_j \left(p_{ij}^1 q_{ij}^1\right) = \sum_i \left(\bar{p}_i^{12} Q_i^2\right) \Big/ \sum_i \left(\bar{p}_i^{11} Q_i^1\right) \qquad [8]$$

Formula [8] expresses an annual Laspeyres quantity index explicitly in terms of annual average prices and total quantities instead of the individual sub-period prices and quantities of [6]. The difficulty that becomes apparent from formula [8] is that the average prices in the numerator and denominator, although both averages of year 1 prices, use different quantity weights. The average prices in the numerator use year 2 weights whereas those in the denominator use year 1 weights.

It follows that formula [6] depends on changes in the prices between the two years and not only on the changes in quantities. It does not, for example, satisfy the elementary index number tests of identity and proportionality. In the present context, the identity test requires that if the total quantity of each good is the same in both years, the quantity index should be unity. The proportionality test generalises this test by requiring that if the total quantity of each good changes by the same proportion between the two years, the index should also change by the same proportion. The unsatisfactory properties of [6] may be illustrated by means of a simple numerical example using the data in Table 4.1. The data for product A already used in the previous section are supplemented by data for a second product, B. The total quantity of product B is assumed to be the same in both years, as with product A. As both quantity relatives are unity, the quantity index should to be unity. However, when formula [6] is used the index is equal to

$(34 + 20) / (41 + 23) = 84.4.$

This result is neither useful nor acceptable for an annual index in which the total quantities of both products are the same in both years. The index is less than unity because it gives more weight to the reductions in quantities in the second half of the year than to equal increases in the first half.

Implicitly, formula [6], or LQ(II), contradicts the assumption of homogeneity by treating quantities in the later sub-periods, when prices are higher as a result of inflation, as if they were superior in quality to quantities in earlier sub-periods of the same year. If the quantities in different sub-periods were really different qualities – in effect, different products – they should not be added together to obtain annual totals. However, inflation means that the prices do indeed rise over time and it is contradictory to treat the increase in the price of a homogeneous product during the course of the year as signalling an improvement in its quality. Formula [6] virtually denies that any inflation takes place during the course of each year, only permitting price changes between years.

Given that the quantity relative for a homogeneous product must be equal to the ratio of the total quantities in the two years, the appropriate version of a Laspeyres type quantity index would appear to be an arithmetic average of these ratios using the total values in the first year as weights. The resulting quantity index, called LQ(III) here, is shown in [9]:

$$L_Q(III) = \sum_i \left\{ \frac{Q_i^2}{Q_i^1} \cdot \sum_j \left(p_{ij}^1 q_{ij}^1\right) \right\} \Big/ \sum_i \sum_j \left(p_{ij}^1 q_{ij}^1\right) = \sum_i \left(\bar{p}_i^{11} Q_i^2\right) \Big/ \sum_i \left(\bar{p}_i^{11} Q_i^1\right) \qquad [9]$$

LQ(III) is a modified version of an annual Laspeyres type index in which all quantities of the same product in both years are valued at a single price, their weighted average price in the first year. In contrast to LQ(II) as given by formula [6], the average first year prices in the numerator are weighted by first, and not second, year quantities. The average prices are therefore exactly the same in both the numerator and the denominator of [9]. This formula satisfies most basic index number tests.

Reverting to the numerical example used above, it follows immediately from the definition of [9] that when the ratios of the total quantities in the two years equal unity for both products, the index must also equal unity, or 100. This contrasts with the figure of 84.4 for LQ(II) given earlier.

LQ(III) may be subtracted from LQ(II) to throw light on the factors responsible for the differences between them.

$$L_Q(II) - L_Q(III) = \sum_i \sum_j \left(p_{ij}^1 - \bar{p}_i^{11}\right)\left(q_{ij}^2 - q_{ij}^1\right) \Big/ \sum_i \sum_j \left(p_{ij}^1 q_{ij}^1\right) \qquad [10]$$

$$\text{so that } L_Q(II) \geq L_Q(III) \quad \text{if} \quad \sum_i \sum_j \left(p_{ij}^1 - \bar{p}_i^{11}\right)\left(q_{ij}^2 - q_{ij}^1\right) \geq 0 \qquad [11]$$

It follows from [11] that the difference between the two indices depends on the correlation, at the level of individual products, between the first year sub-period prices and the year to year quantity changes. LQ(II) will be greater or less than LQ(III) depending upon whether this correlation tends to be positive or negative for most products. In the numerical example, there is a strong negative correlation for both products between the sub-period prices in year 1 and the quantity changes, so that LQ(III) is greater than LQ(II). It is not possible, however, to generalise about the sign of these correlations and either index may be greater than the other in practice.

When there is high inflation, it may be inferred from [10] and [11] that LQ(II) will tend to exceed LQ(III) – that is, to have an upward bias – when the quantity changes tend to be greatest for the later sub-periods: in other words, when there is an upturn in economic activity or growth accelerates. Conversely, if there is a downturn or growth decelerates, LQ(II) will tend to have a downward bias.

It may be concluded that by imposing the same average prices on the total quantities in both years LQ(III) marks a considerable improvement over LQ(II). Nevertheless, under high inflation, the average prices themselves are inevitably dominated by the high prices towards the end of the year. To the extent that the end of year prices are not typical of the year as a whole, the average prices are biassed so that LQ(III) cannot be regarded as optimal. This defect may be remedied by using CPL accounts, as explained later.

**Paasche price indices and implicit price deflators for Laspeyres quantity indices**

The implicit price deflator obtained by dividing the ratio of the current values by the Laspeyres index, LQ(III), is given in equation [12].

$$\text{Implicit deflator} \qquad \frac{\sum_i V_i^2}{\sum_i V_i^1} \Big/ \frac{\sum_i \left(\bar{p}_i^{11} Q_i^2\right)}{\sum_i \left(\bar{p}_i^{11} Q_i^1\right)} = \frac{\sum_i \left(\bar{p}_i^{22} Q_i^2\right)}{\sum_i \left(\bar{p}_i^{11} Q_i^2\right)} \qquad [12]$$

It is the aggregate version of equation [2]. The average prices in the numerator and denominator of [12] use different quantity weights as shown by their second superscripts. The index is therefore dependent on changes in the distribution of the quantities between the two years and not only on the price changes. It

does not satisfy the identity and proportionality tests of index number theory. In the present context, the proportionality test requires that if the price of each product in each sub-period in year 2 is a constant multiple of the corresponding price in year 1, the price index should equal that constant. The unsatisfactory properties of [12] may be illustrated using the data in Table 4.1. The implicit deflator [12] is only 2.52 whereas the ratios of the unweighted average prices for products A and B are 3 and 3.08 respectively (using year 2 quantities as weights the ratios are 3 and 2.95, while using year 1 quantities as weights they are 3 and 3.35).

The implicit deflator [12] is not, of course, identical with the Paasche price index even though it is obtained by dividing the change in values by the annual Laspeyres type quantity index, LQ(III). The standard formula for an annual Paasche price index is given in [13] where it is also expressed in terms of annual average prices and total quantities in order to facilitate comparisons with the implicit deflator.

Paasche price index

$$\frac{\sum_i \sum_j \left(p_{ij}^2 q_{ij}^2\right)}{\sum_i \sum_j \left(p_{ij}^1 q_{ij}^2\right)} = \frac{\sum_i \left(\bar{p}_i^{22} Q_i^2\right)}{\sum_i \left(\bar{p}_i^{12} Q_i^2\right)} \qquad [13]$$

The crucial difference between [12] and [13] is that the average prices in the numerator and denominator of [13] both use the same quantities as weights, those of year 2, whereas the average prices in [12] use different weights, as just noted. For this reason [13] is acceptable as a price index whereas the implicit deflator [12] is not. While [13] satisfies the identity and proportionality tests, for example, [12] does not.

The Paasche price index can also be calculated as a weighted harmonic average of the ratios of the average prices using the second year values as weights. In this case, the average prices in both years must use the second year quantities as weights, as in [13]. Calculated this way, the index is identical with [13]. The numerical value of the Paasche price index using the data in Table 5.1 is 2.98 (the ratios of the average prices for the two products using year 2 quantities as weights being 3 and 2.95).

Although the Paasche price index defined in [13] meets some of the the basic requirements of an index number it may still be subject to bias under certain conditions when there is high inflation. The average prices in [13] are bound to be dominated by the prices occurring towards the end of each year. If inflation accelerates (decelerates) signficantly over the two years, [13] will tend to over (under) state the average price increase between the same sub-periods in the two years. This defect may also be remedied by using CPL accounts, as explained later.

**The Laspeyres price index and Paasche quantity index**

The properties and behaviour the annual Laspeyres price and Paasche quantity indices under high inflation parallel those of the Paasche price and Laspeyres quantity indices just discussed. It may be useful, nevertheless, to give the relevant formulae.

The indices may be defined as before in terms of the annual average prices and total quantities of the various products in the two years.

Laspeyres price

$$\frac{\sum_i \sum_j \left(p_{ij}^2 q_{ij}^1\right)}{\sum_i \sum_j \left(p_{ij}^1 q_{ij}^1\right)} = \frac{\sum_i \left(\bar{p}_i^{21} Q_i^1\right)}{\sum_i \left(\bar{p}_i^{11} Q_i^1\right)} \qquad [14]$$

As can be seen from the second superscripts, the average prices use the quantities in the first year as weights. The Laspeyres price index may also be interpreted as a weighted arithmetic average of the ratios of these average prices, using the total values of each product in the first year as weights. This index, like the Paasche price index, suffers from the fact that, under high inflation, the average prices may be dominated by the prices towards the end of the year. The index may therefore be biassed.

The most suitable version of an annual Paasche quantity index under high inflation is the Paasche equivalent of LQ(III): namely, a weighted harmonic average of the ratios of the total quantities using the values of each product in the second year as weights.

Paasche quantity

$$\sum_i \sum_j \left(p_{ij}^2 q_{ij}^2\right) \Big/ \sum_i \left\{ \frac{Q_i^1}{Q_i^2} \cdot \sum_j \left(p_{ij}^2 q_{ij}^2\right) \right\} = \frac{\sum_i \bar{p}_i^{22} Q_i^2}{\sum_i \bar{p}_i^{22} Q_i^1} \qquad [15]$$

All quantities in both years are valued at their year 2 average prices in instead of their individual sub-period prices in year 2.

It is easily verified that deflating changes in current values by the annual Laspeyres price index [14] does not yield the Paasche quantity index given in [15] but a quantity index analogous to LQ(II).

**Partitioning value changes into price and quantity components**

It is common practice in national accounts to obtain either the price or the quantity index indirectly. In particular, current values are often deflated by Paasche price indices in order to derive Laspeyres volume measures. Under high inflation, however, deflation by a Paasche price index results in an indirect quantity measure of type LQ(II) which is unsatisfactory as a quantity index. In general, under high inflation, it is not possible to partition changes in the aggregate values in the current accounts into price and quantity changes both of which are acceptable as index numbers in their own right.

If the availability and reliability of the basic data are such that it is necessary to derive quantity indices indirectly by deflating ordinary current accounts, special price deflators need to be constructed because standard price indices, such as Laspeyres or Paasche, are generally unsuitable for this purpose if there is much inflation. Such deflators may have to use ratios of average prices in which the quantity weights are not the same in both years, as in formula [2] above.

**Calculating annual indices from sub-period indices**

The improved versions of the annual Laspeyres and Paasche quantity indices given in [9] and [15] were derived by replacing individual sub-period quantities and prices by the total quantities and average prices for the year as a whole and defining the annual indices in terms of these total quantities and average prices. The easiest way to calculate them in practice, however, may be as weighted averages of the sub-period quantity indices. A sub-period index is to be understood as a quantity or price index connecting the same sub-period in two different years: for example, an index of January on the previous January, or the first quarter on the previous year's first quarter. Ideally, the sub-periods should be so short that the amount of price variation within a single sub-period is minimal.

The annual quantity indices given in [9] and [15] are expressed as annual averages of the corresponding sub-period indices in [16] and [17].

Laspeyres quantity (III)

$$\sum_j \left\{ \frac{\sum_i \left(\bar{p}_i^{11} q_{ij}^2\right)}{\sum_i \left(\bar{p}_i^{11} q_{ij}^1\right)} \cdot \sum_i \left(\bar{p}_i^{11} Q_{ij}^1\right) \right\} \Big/ \sum_j \sum_i \left(\bar{p}_i^{11} q_{ij}^1\right) = \frac{\sum_i \left( \bar{p}_i^{11} \sum_j q_{ij}^2 \right)}{\sum_i \left( \bar{p}_i^{11} \sum_j q_{ij}^1 \right)} \qquad [16]$$

Paasche quantity

$$\sum_j \sum_i \left(p_{ij}^{22} q_{ij}^2\right) \Big/ \sum_j \left\{ \frac{\sum_i \left(\bar{p}_i^{22} q_{ij}^1\right)}{\sum_i \left(\bar{p}_i^{22} q_{ij}^2\right)} \cdot \sum_i \left(\bar{p}_i^{22} q_{ij}^2\right) \right\} = \frac{\sum_i \left( \bar{p}_i^{22} \sum_j q_{ij}^2 \right)}{\sum_i \left( \bar{p}_i^{22} \sum_j q_{ij}^1 \right)} \qquad [17]$$

The difficulty with these formulae is that the sub-period quantity indices use average base year prices and not individual sub-period prices, although sub-period quantity indices that use their own prices may provide suitable proxies. Whatever prices are used, however, the sub-period quantity indices must be weighted by sub-period volume shares in the base year and not current value shares.

A possible substitute for sub-period volume shares at constant prices is provided by the value shares in the CPL accounts. In practice, however, it is better to use CPL accounts much more systematically to solve the kinds of problems dealt with in this section and not to use them in an *ad hoc* way. It will be shown in the next section that the potential biasses discussed above that stem from the use of current price accounts as a basis for price and quantity comparisons can be avoided by using CPL accounts instead.

## AGGREGATE PRICE AND QUANTITY INDICES BASED ON CPL ACCOUNTS

Many of the conclusions to be drawn from the previous sections are essentially cautionary. They demonstrate the extreme difficulty and complexity of trying to compile satisfactory price and quantity measures for discrete time periods working directly from accounting data in which prices may be highly variable as a result of inflation. Applying standard index number formulae directly to the individual prices and quantities in the various sub-periods under conditions of high inflation may yield unacceptable quantity or price measures which do not satisfy basic index number criteria. It is generally impossible to partition value changes into price and quantity components, both of which are satisfactory measures in their own right.

As the difficulties stem from the price variation within each accounting period, the obvious solution is stabilise the general price level **within** each period prior to calculating the price and quantity indices **between** different accounting periods. In other words, the price and quantity indices should be calculated starting from the CPL accounts instead of the original unadjusted accounts.

CPL accounts require a general price index to be available for all the individual sub-periods in both years. It should be noted that a high frequency price index does not encounter the kinds of problems discussed in previous sections because the sub-periods should be short enough to ensure that the amount of price variation within each sub-period is minimal. In effect, the sub-periods are meant to be so short the they can be treated as reasonable approximations to the points of time assumed in conventional index number theory.

The general index is used to scale the sub-period current values up or down to a constant price level. It should therefore use a set of quantity weights that are representative of the year in question, such as the total (or average) quantities for the year or mid-year quantities. Seasonal products may present a problem, however, if a single point of time is chosen. In any case, each year's general price index should have its own weights and not those of some fixed base period.

It was explained in Chapter 4 that once a set of CPL accounts has been calculated, they can be scaled up or down to other price levels simply by multiplying through by a constant scalar. For purposes of making price and quantity comparisons between flows of goods and services in different years, it is desirable to scale the CPL figures in each of the years so that their total is the same as that for the original flows. In this way, increases in CPL values from one year to another will reflect the full impact of inflation even though the price level is stable within the CPL accounts for a single year taken in isolation. There must, of course, be a discontinuity between the CPL value of a flow of goods and services in last sub-period of one year and that for the first sub-period of the following year.

### Laspeyres quantity and Paasche price indices derived from CPL accounts

Suppose an annual Laspeyres quantity index as defined in [6] or [8] above is calculated using the prices and quantities in the CPL accounts, the CPL prices being the original prices scaled up or down as appropriate by the general price index. The resulting index should provide a satisfactory quantity measure provided that any price differences during the year which remain can be assumed to reflect corresponding differences in quality. After the inflationary price increases have been eliminated, the proviso may become not unreasonable.

Over a period as long as a year, the prices of some products will inevitably change in the CPL accounts, even though the general price level remains constant, just as when there is zero inflation. The price changes must, however, be **relative** price changes. Changes in relative prices should reflect changes in relative costs, preferences or other factors influencing market supply or demand which may also signal changes in quality.

In these circumstances, an increase (decrease) in the average price of a product between years 1 and 2 in formula [8] may reflect a change in its average quality due to a shift in the mix of quantities towards better (inferior) varieties of the product. If the increase in the average "price" does reflect an increase in average quality, it is not a real price increase but a kind of quality adjustment which it is appropriate to include as a component of a quantity index. This interpretation is often placed on formulas [6] or [8]. Whether the interpretation is correct is, of course, strictly a matter of fact and not theory, depending on the nature of the data. There is a good *prima facie* case for accepting it in the case of CPL accounts and prices.

The objections raised in previous sections to the application of formula [6] or [8] cease to be valid if the price differences within each year reflect differences in quality instead of genuine price differences. Furthermore, quantities of the "same" product should not be added together if they are not, in fact, homogeneous. The ratio of the total quantities in each year is not necessarily the most appropriate quantity relative for a "product" which is not homogeneous. LO(III), or formula [9], should not be used if the quantities sold at different prices are different qualities or varieties of the same generic product.

On the other hand, it is clear that the objections raised in previous sections to formula [6] remain valid for current accounts compiled under conditions of high inflation. Almost by definition, when there is high inflation most prices are likely to double or treble during the course of the year. These inflationary price increases must swamp any changes in relative prices that may be going on at the same time. Switching to CPL accounts, however, removes the massive inflationary price increases within the accounting period to leave only the relative price changes.

It is therefore legitimate to revert to the standard formulae for Laspeyres and Paasche quantity indices, such as formula [6], when working with CPL data. Similarly, the use of the standard formulae for Laspeyres and Paasche price indices is also appropriate in the case of CPL accounts. The changes in the average prices shown in [13] and [14] above are no longer dominated by the prices in the later sub-periods after the general price level has been stabilised. The potential bias resulting from this dominance is eliminated.

It follows that the changes in values from year to year in the CPL accounts can be factored exhaustively into their price and quantity components – *i.e.*, without a discrepancy or remainder – using standard complementary Laspeyres and Paasche quantity and price indices. Moreover, by scaling the aggregate CPL values to equal their corresponding value at current prices in both years, the same factoring also becomes applicable to the original current accounts, even though the latter cannot be factored directly for reasons given in the earlier sections of this chapter.

As standard Laspeyres and Paasche indices appear to be well behaved under conditions of high inflation after the transformation is made from ordinary current accounts to CPL accounts, it may be inferred that other index number formulae are also likely to retain their normal properties when calculated from CPL data. In particular, the best way in which to calculate the Fisher indices recommended in the 1993 SNA is from CPL data and accounts.

**The use of sub-period indices**

There remains the question of the best way in which to calculate indices for CPL data in practice. It is sufficient to examine this for Laspeyres quantity and Paasche price indices, as the implications for other indices are fairly evident.

In general, an annual Laspeyres index can be expressed as a weighted arithmetic average of the corresponding sub-period indices using the year 1 sub-period values as weights: for example, in the case of the quantity index,

Laspeyres quantity

$$\frac{\sum_i \sum_j \left(p_{ij}^1 q_{ij}^2\right)}{\sum_i \sum_j \left(p_{ij}^1 q_{ij}^1\right)} = \sum_j \left\{ \left[ \frac{\sum_i \left(p_{ij}^1 q_{ij}^2\right)}{\sum_i \left(p_{ij}^1 q_{ij}^1\right)} \cdot \sum_i \left(p_{ij}^1 q_{ij}^1\right) \right] \right\} \Bigg/ \sum_j \sum_i \left(p_{ij}^1 q_{ij}^1\right) \qquad [18]$$

Assume now that [18] refers to the CPL accounts, as the identity must hold for any type of account. The CPL value weights for the various sub-periods are given straightforwardly by scaling the original current values up or down by the general price index. In moving from sub-period indices calculated at actual year 1 prices to indices at CPL prices, all prices in the numerator and denominator of each individual index are scaled up or down by the the same constant. The sub-period quantity indices at CPL prices are therefore identical with those at actual prices. Thus, the annual CPL quantity index simply involves reweighting the year to year sub-period indices by replacing their current value weights by CPL value weights. Given that sub-period indices are needed in any case under high inflation, the calculation of annual CPL quantity indices is not merely perfectly feasible but quits simple.

The annual Paasche price index is a weighted harmonic average of the sub-period Paasche indices using year 2 values as weights. The calculation of an annual CPL price index, however, is complicated by the fact that the value of the general deflator for the prices in a given sub-period is not the same in both years. To move from the sub-period Paasche price index based on actual prices to the CPL index the former needs to be multiplied by the ratio of the year 2 deflator to the year 1 deflator for that particular sub-period. After making this adjustment, the annual index is obtained as a weighted average of the CPL sub-period indices using CPL value weights. Thus, as in the case of the quantity indices, it is relatively simple to calculate the annual CPL price indices starting from sub-period indices that use the actual prices in the two sub-periods concerned.

Other types of the annual CPL indices may be calculated from the sub-period indices by working out similar procedures to those described above. It may be concluded that, in general, whenever sub-period indices can be calculated it must be feasible to calculate annual CPL indices. If sub-period indices cannot be calculated, meaningful price and quantity comparisons may have to be abandoned under conditions of high inflation.

## ANNUAL PRICE AND QUANTITY INDICES UNDER LOW OR ZERO INFLATION

As a postscript to this chapter it is worth noting that the procedures indicated above for the calculation of annual indices as weighted averages of sub-period indices using CPL values as weights should be applied even under conditions of low or zero inflation. Consider the limiting case of zero inflation in which the general index of inflation remains constant from sub-period to sub-period. Although there may be no general inflation, some degree of variation in relative prices is bound to be present in the accounts if only because of seasonal variations in prices.

It was argued above that changes in relative prices are likely to reflect qualitative changes in the products concerned. This argument is also valid for seasonal price changes, which are essentially regularly recurring relative price changes. For example, Stone argued as follows. "The existence of a regular seasonal pattern in prices which more or less repeats itself year after year suggests very strongly that the varieties of a commodity available at different seasons cannot be transformed into one another without cost and that, accordingly, in all cases where seasonal variations in prices are significant, the varieties available at different times of the year should be treated, in principle, as separate commodities." (Stone, 1956, pp. 74, 75.) Similarly, in paragraph 16.108 of the 1993 SNA it is stated that: "goods or services provided at different times of the day or at different periods of the year must be treated as different qualities even if they are otherwise identical. ... Fruit and vegetables supplied out of season must be treated as higher qualities than the same fruit and vegetables in season which are cheaper to produce and of which consumes may be satiated." Thus, changes in relative prices between seasons reflect quality changes which should be taken into account when calculating annual indices. In the absence of inflation this may be done by averaging the sub-period quantity indices using the actual sub-period values as weights. Stone proposed that "if the varieties available at different seasons are treated as separate commodities then it would be possible, in the construction of annual quantity index-numbers to include the change between the base and the current period for each season separately and to weight these changes by the appropriate seasonal expenditures". This procedure coincides with the CPL method based on sub-period indices in the special case in which there is no inflation. When there is inflation, however, it is necessary to scale the expenditures in the different

seasons to the same general price level to avoid biassing the annual index towards the changes between the sub-periods or seasons in the later part of the year. For a detailed and rigorous discussion of the compilation of index numbers for seasonal commodities under high inflation reference should be made to Diewert (1996).

The general conclusion to be drawn is that whenever prices vary significantly during the course of the year, whether because of general inflation or changes in relative prices, including seasonal price changes, separate indices should be compiled for different sub-periods and then averaged using appropriate weights to obtain the annual index. As prices are never stable in practice, even when there is zero inflation, this method should be followed whenever possible to avoid the risk of bias in the estimates of year to year quantity and price changes. Although this conclusion is not stated explicitly in the 1993 SNA it follows from the arguments of paragraph 16.108. Thus, even in the absence of inflation it is prudent to build up the annual indices from the sub-period ones. As soon as there is even moderate inflation it becomes imperative to do so using CPL accounts if precise and reliable measures of year to year quantity and price changes are required.

Annex 4.1

# FACTORING VALUE CHANGES INTO THEIR PRICE AND QUANTITY COMPONENTS AT THE LEVEL OF A SINGLE PRODUCT

At the level of a single homogeneous product, the quantity relative between two accounting years is measured by the ratio of the total quantities. This is identical with the ratio of the unweighted arithmetic averages of the sub-period quantities. The matching price relative is the ratio of the unweighted averages of the sub-period prices. The question examined in this annex is under what conditions the product of these two relatives is equal to the value change between the two periods.

Equation [19] shows a general statistical identity relating actual price and quantity observations to their deviations from their respective unweighted arithmetic means.

$$\sum_j (p_j q_j) = \bar{p}\sum_j q_j + \sum_j (p_j - \bar{p})(q_j - \bar{q}) \qquad [19]$$

$$\text{where } \bar{p} = \sum_j p_j \Big/ m \quad \text{and} \quad \bar{q} = \sum_j q_j \Big/ m$$

Dividing through by the first term on the right hand side of [19] we have

$$\sum_j (p_j q_j) \Big/ \bar{p}\sum_j q_j = 1 + r_{pq} v_p v_q \qquad [20]$$

where $r$ is the correlation coefficient between the sub-period prices and quantities and the $v$'s refer to their respective coefficients of variation (*i.e.*, standard deviations divided by averages).

By utilising [19] and [20], and the definition of Vgiven in equation [1], the following relationship may be derived:

$$\left(\frac{\bar{p}^2}{\bar{p}^1}\right)\left(\frac{\bar{q}^2}{\bar{q}^1}\right) = \frac{V^2}{V^1}\left\{\frac{1 + r_{p^2q^2} v_{p^2} v_{q^2}}{1 + r_{p^1q^1} v_{p^1} v_{q^1}}\right\} \qquad [21]$$

The left side of [21] shows the product of the price and quantity relatives defined as ratios of the unweighted arithmetic averages of the sub-period prices and quantities. It is equal to the ratio of the current values shown on the right side when the expression in brackets is equal to unity. There are various special conditions under which this occurs: for example, if the sub-period quantities are constant within each year so that both the $r$'s and the relevant $v$'s are zero.

Of more interest is the general case in which quantities as well as prices vary in both the years so that the term in brackets depends on the correlations between the sub-period prices and quantities in the two years. It is bound to be unity if both correlations are zero and either unity, or close to unity, if the correlations are non-zero but equal. If the correlations have opposite signs there may be a significant discrepancy between the product of the price and quantity relatives and the change in values.

Suppose, for example, the correlation is positive in year 1 and negative in year 2. The product of the price and quantity relatives must then exceed the value change. Assuming the prices are rising throughout, these correlations imply that the quantity relatives tend to fall from sub-period to sub-period. The prices and quantities in the numerical example in the first part of Table 4.1 fit this pattern. The price relative is 3 and the quantity relative 1, but the ratio of the values is only 2.49.

In these circumstances the derived indices obtained by dividing the change in values by a direct index may be very misleading. Deflating the change in values by the price index of 3 yields an indirect quantity index of 0.82 whereas the total quantities do not change. Similary, dividing the change in values by the quantity index yields an indirect price index of 2.49 instead of 3.

Under high inflation, the correlations in equation [21] are likely to be of opposite sign whenever there is a turning point in economic activity during the two years covered. In the numerical example of part A of Table 4.1 there is a modest peak in the quantities around the end of the first year. If the quantities in years 1 and 2 were to be reversed, thereby creating a modest trough around the end of year 1, the correlations in [21] would be negative in the numerator and positive in the denominator. In this case, the product of the price and quantity relatives is less than the new change in values (3.62).

When prices are rising within each year, there may be no satisfactory way, even at the level of a single homogeneous product, of partitioning the change in year to year values into price and quantity components both of which are acceptable measures of price and quantity change. As explained in the main text, the problem lies not with the price and quantity measures but with the current values when identical quantities of the same product are aggregated at different prices.

Table 4.1. **Price and volume indices under high ination**

| Product | | Quarters | | | | Year |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | |
| A | $p^1$ | 4 | 5 | 6 | 10 | 6 833 |
| | $q^1$ | 1 | 1 | 2 | 2 | 6 000 |
| | $v^1$ | 4 | 5 | 12 | 20 | 41 000 |
| A | $p^2$ | 12 | 15 | 18 | 30 | 17 000 |
| | $q^2$ | 2 | 2 | 1 | 1 | 6 000 |
| | $v^2$ | 24 | 30 | 18 | 30 | 102 000 |
| | $p^1q^2$ | 8 | 10 | 6 | 10 | 34 000 |
| | $p^2q^1$ | 12 | 15 | 36 | 60 | 123 000 |
| B | $p^1$ | 2 | 3 | 3 | 4 | 3 286 |
| | $q^1$ | 1 | 1 | 2 | 3 | 7 000 |
| | $v^1$ | 2 | 3 | 6 | 12 | 23 000 |
| B | $p^2$ | 5 | 7 | 10 | 15 | 8 429 |
| | $q^2$ | 2 | 2 | 2 | 1 | 7 000 |
| | $v^2$ | 10 | 14 | 20 | 15 | 59 000 |
| | $p^1q^2$ | 4 | 6 | 6 | 4 | 20 000 |
| | $p^2q^1$ | 5 | 7 | 20 | 45 | 77 000 |

Indices for period 2 based on the same quarter in period 1

| | | | | | |
|---|---|---|---|---|---|
| Laspeyres price index | 283.3 | 275.0 | 311.1 | 328.1 | 312.5 |
| Paasche volume index | 200.0 | 200.0 | 67.9 | 42.9 | 80.5 |
| Laspeyres volume index | 200.0 | 200.0 | 66.7 | 43.8 | 84.4 |
| Paasche price index | 283.3 | 275.0 | 316.7 | 321.4 | 298.1 |

# 5. ASSET PRICES, HOLDING GAINS AND INDEXATION

## INTRODUCTION

The purpose of this chapter is to explain how holding gains are calculated on various types of assets, particularly financial assets. Most of the literature on price changes is concerned with flows of goods and services and very little attention is given to changes in the prices of stocks of assets. These must be correctly identified and measured, however, if holding gains are to be measured properly. Under high inflation nominal holding gains may become very large over a period as long as a year and they can have a signifcant impact on economic behaviour. It also becomes increasingly common to adjust the values of loans and securities on the basis of the change in some price index or in the price of some selected product. The accounting treatment of index linked assets of this kind is also explained.

### Nominal and real holding gains or losses

Balance sheets record the values of stocks of assets and liabilities at particular moments of time. The changes between the values of the assets and liabilities shown in the opening and closing balance sheets are fully accounted for in the SNA by four accounts. As explained in Chapter II of the 1993 SNA,

1. the capital account records changes in non-financial assets attributable to actual or internal transactions;
2. the financial account records changes in financial assets attributable to transactions;
3. the "other" changes in the volume of assets account records changes in quantities of assets of all kinds that are not due to transactions;
4. the "revaluation" account records changes in the values of assets of all kinds that are due to changes in their prices.

A more apt and informative description for the fourth account would be the "holding gains" account as all the entries in the account consist of holding gains or losses.

Changes over time in the monetary values of assets and liabilities caused by changes in **their own** prices constitute **nominal** holding gains or losses. In the SNA, they are partitioned into **neutral** holding gains, which reflect the general rate of inflation, and **real** holding gains, which result from changes in the relative prices of the assets or liabilities concerned. The value of the nominal holding gain on quantity $q$ of an asset between times o and t is given by $(p_t - p_o)q$: see paragraphs 12.68 to 12.73 of the 1993 SNA. Negative gains are described as holding losses. The calculation of a nominal holding gain requires the quantity unit for an asset to be correctly identified so that the price of a unit of that asset can also be identified. The distinction between value changes due to quantity changes and those due to price changes is by no means obvious for some types of assets, especially certain financial assets and liabilities.

### Prices and *numéraires*

The same concepts and principles as are used to measure price changes for flows of goods and services must be applied when calculating changes in the prices of assets. In particular, the prices must refer to quantities that remain homogeneous over time. A change in the value per unit of quantity due to a change in the physical or economic characteristics of the asset is not a price change. It reflects a change in the **quality**, and hence volume, of the asset. For example, the increase in the value of a given quantity of wine due to its maturing over time reflects increased output from the process of producing vintage wine.

Ordinary language does not distinguish the change in the quality of the wine and it is natural to say that the "price" of the wine increases while it matures. From an economic (and a connoisseur's) point of view, however, it is no longer the same wine. After adjusting for the improvement in its quality, there may be no price increase. It is universally accepted in the construction of price indices that quality adjustments have to be made for changes in the physical or economic characteristics of the goods or services covered.

A less familiar example of a quality change is the gradual increase in the market value of a bill or bond sold at a discount due to the subsequent accumulation of accruing interest. Again, ordinary language is not sufficiently precise because it is natural to describe this phenomenon as an increase in the market "price" of "the" bill or bond, but the security is changing qualitatively over time as it approaches maturity. The qualitative change is due to the reinvestment of the interest which is recorded as additional lending in the financial accounts of both the issuer and the holder of the security. This additional lending increases the market value of the security by increasing its volume, not its price. There is no nominal holding gain or loss.

The **nominal** price of an entity may be defined as the number of units of the *numéraire* for which that entity may be exchanged. In practice, the national currency almost invariably serves as the *numéraire* in business and national accounts, but on occasions it may be convenient to use other *numéraires*, such as a foreign currency or gold. Nominal holding gains measure changes in the value of assets due to changes in their nominal prices. When the national currency is the *numéraire*, the price of the basic unit of that currency – the dollar, mark, pound, franc, etc. – is always unity, by definition. The price of the *numéraire* cannot change over time so that there can be no nominal holding gains on holdings of national currency.

Suppose, on the other hand, that the *numéraire* is switched to gold. In this case, the price of a unit of national currency (*i.e.*, the number of units of gold per unit of currency) falls rapidly in a period of high inflation. Substantial nominal holding losses (in terms of gold) will accrue to holders of currency. Thus, nominal holding gains or losses depend heavily on the choice of *numéraire* in which nominal prices are denominated. The consequences, under conditions of high inflation, of switching from the national currency to some other *numéraire* are are examined in some detail in the final section of this chapter.

On the other hand, the **relative** price of an item – *i.e.*, the ratio of its price to the price of another item – is invariant to the choice of *numéraire*. As real holding gains depend on relative prices, it follows that real holding gains also do not depend on the choice of *numéraire* (except for a scalar). The relative sizes of real holding gains are completely invariant to the *numéraire*, as illustrated in the final section of the chapter. During high inflation the relative price of currency falls rapidly against most other items, this instability making it unsuitable as a *numéraire* for many accounting purposes.

## NOMINAL HOLDING GAINS AND LOSSES

As already noted, the nominal holding gain or loss on a given quantity $q$ of an asset is given by $(p_t - p_o)q$ where $p$ denotes the nominal price of the asset at time $t$. As assets and liabilites are valued in balance sheets at current prices, the nominal holding gain or loss on a fixed quantity of an asset is equal to the change in its balance sheet values. When the quantity of the asset held varies, however, the nominal holding gain is only equal to the change in the balance sheet values after subtracting the value of any transactions and "other" volume changes. This fundamental identity is proved in paragraphs 1 to 10 of the Annex to Chapter XII of the 1993 SNA. It holds even if the quantity of the asset happens to be zero at the beginning or end of the period covered. It may often be convenient to calculate nominal holding gains or losses residually from balance sheet data and data on transactions and "other" changes, but holding gains are not a balancing item. They may be calculated directly if the required price and quantity data are available.

All nominal holding gains or losses are recorded, whether they are realised or not. Gains are realised when the owner sells, uses or otherwise disposes of an asset. The nominal holding gains accruing up to the moment an asset is disposed of, or from the moment it is acquired, are included, irrespectively of when the balance sheets are compiled. When a gain is realised, the sale, use or disposal is recorded in one or other of the flow accounts – the production account, the capital or financial accounts, or the "other" volume change account, as the case may be – depending on the nature of the asset and whether or nor it is disposed of in a transaction. Unrealised gains or losses are included in the closing balance sheet values.

### Financial assets and liabilities

The quantity units and prices of financial assets and liabilities are not always self evident. The relevant units and prices for the main categories of assets and liabilities are described below, using the SNA classification of financial instruments.

#### *National and foreign currency* (AF.21)

Assuming that the national currency is the *numéraire*, the unit of quantity for currency itself is the basic monetary unit – the dollar, pound, peso, franc, and so on. The nominal price of a unit of currency is unity, by definition, and cannot change so long as it continues to be the *numéraire*. There can be no nominal holding gains on national currency, but there may, of course, be nominal holding gains on holdings of **foreign** currency as the **price** of a unit of foreign currency – *i.e.*,the number of units of national currency for which it may be exchanged – changes whenever there is a change in the foreign exchange rate.

Similarly, there may also be nominal holding gains or losses on units of national currency to be paid or received on a specified date in the future. As explained in the Annex to Chapter 2, commodities to be delivered on different dates are different commodities from an economic point of view and command different prices on the market. The forward price of any commodity, including the *numéraire* currency itself, must be clearly distinguished from its spot price. Although the spot price of a unit of currency must always be unity, the forward price of a unit of currency $n$ periods in the future is $1/(1 + r)^n$ where $r$ is the current nominal rate of interest. This price may be well below unity, especially under high inflation when nominal interest rates are likely to be of the same order of magnitude as the expected rate of inflation itself, as already noted in Chapter 3 above. Changes in the **forward** prices of units of currency as a result of changing interest rates give rise to nominal holding gains or losses in the same way as for any other commodity. For this reason, nominal holding gains or losses may accrue to holders of bills and bonds even though they cannot occur on ordinary deposits or loans. In effect, buyers and sellers of bills and bonds are buying and selling future units of currency at their current forward price whereas ordinary borrowing and lending is conducted at the currency's spot price – unity.

#### *Deposits* (AF.22 *and* AF.29)

A deposit is a collective term for quantities of currency deposited with a financial intermediary. A deposit is not itself an entity whose price can vary. A deposit of 100 dollars, for example, is twice the size of a deposit of 50 dollars and not twice the price. Only the individual units of currency of which it is composed have a price. In this respect, a deposit is similar to any collection of items such as a stock, or inventory, of a homogeneous product, such as oil or sugar, whose size can be continuously varied. Nominal holding gains accrue on such stocks only if the price per unit of the product of which it is composed changes. Similarly, nominal holding gains accrue on a deposit only if the price of a unit of the currency of which it is composed changes. When a deposit is made in the national currency used as the *numéraire*, the price cannot change. There can be no nominal holding gains or losses on deposits denominated in national currency. On the other hand, there may be holding gains or losses on deposits of foreign currency whose unit price can change.

#### *Loans/debts* (AF.4) *and other receivables/payables* (AF.7)

*Loans/debts* and *other accounts receivable/payable* are similarly collective terms for quantities of currency lent by one unit to another. A loan is a contract in which a creditor lends a debtor a certain number of units of currency, described as the principal outstanding (see paragraph 7.93 of the 1993 SNA). The loan, like a deposit, is not an entity with a variable price of its own. The relevant price, which governs whether any nominal holding gain accrues, is that of the units of currency on loan. As in the case of deposits, no nominal gains can accrue on loans denominated in national currency but they can accrue on loans denominated in foreign currency.

The amount of the principal may be written up or down by mutual agreement between the creditor and the debtor. It is misleading to describe such revisions as revaluations as they do not change either the price of the loan itself (which has no price) or that of the currency units involved. Such agreements increase or decrease the sizes of the loans, *i.e.*, the number of currency units on loan. No holding gains or losses occur. Any increase or decrease in the principal requires new transactions between the two parties to the loan. For example, as explained in paragraphs 10.139 and 11.23 of the 1993 SNA, when a creditor and a debtor agree to write down, or write off, an outstanding loan, a capital transfer from the creditor to the debtor for the amount involved is recorded in their capital accounts together with the simultaneous repayment of the principal in their financial accounts. Conversely, when the creditor and the debtor agree to write up a loan under an indexation agreement, a capital transfer from the debtor to the creditor is recorded together with an equal additional amount of lending by the creditor. This case is discussed more fully below.

***Securities other than shares* (AF.3)**

Bills, bonds, debentures and similar securities are assets that are bought and sold on financial markets. They have market prices that generally differ from their par values. The par value is the amount of principal that the debtor – *i.e.*, the issuer of the bill, bond or similar security – is obliged to pay to redeem the asset when it matures on a specified future date. The market price is equal to the present value of that future payment – *i.e* , the par value discounted to the present at the current market rate of interest – plus the present value of the remaining stream of cash interest payments, if any. Variations in market rates of interest therefore cause instantaneous reciprocal variations in the market prices of these securities which generate nominal holding gains or losses for both the creditors and the debtors – *i.e.*, the current holders of the securities and the issuers. These price changes must be distinguished from changes in market values due to the accumulation of reinvested interest.

When a security is issued at a discount, the excess of the par value over the issue price is gradually eliminated over the life of the security by the continuous accrual and reinvestment of interest. This interest is recorded in the financial accounts as being lent by the current owner to the issuer of the security (see paragraphs 7.102 and 11.77 of the 1993 SNA). The ensuing increase in the market value of the security reflects an increase in the size of the owner's claim resulting from additional lending. There is no price increase and no nominal holding gain.

Price changes due to variations in market rates of interest are superimposed on value increases due to the gradual accumulation of reinvested interest. These price changes generate nominal holding gains or losses for both the issuers and the holders of the securities, the issuer's gain (loss) being equal to the holder's loss (gain). The gains or losses may be realised, if desired, by selling or buying back the securities. An increase (decrease) in the market price of a security reduces (increases) the excess of the par value over the current market price and necessarily reduces (increases) the interest accruing over the remaining life of the security. The nominal holding gain or loss is therefore counterbalanced by an equal and opposite change in the amount of interest accruing subsequently, thereby ensuring that the total return over the entire life of the asset remains unchanged, whether the return is received in the form of a holding gain or interest.

The total return received over the life of a security is fixed at the time of issue by the size of the discount and the amount of any periodic cash payments of interest. The latter cannot be varied subsequently, but a change in the market price of a security resulting from an interest rate change means that the holder and issuer are obliged to accept an instant nominal holding gain or loss in exchange for an equal and opposite amount of interest over the remaining life of the asset. The times at which returns are received are important as well as their total. For example, an increase in the market price of a security makes the holder better off by accelerating the returns, an immediate holding gain being substituted for later interest receipts. The gain is, of course, reflected in the balance sheet and increases the holder's net worth. Conversely, the issuer is worse off. The issuer's current liability is increased reflecting the increased current cost of buying back the security.

Nominal holding gains or losses need not cancel each other out over the life of a security simply because the market value of the security must revert to its par value by the time it is redeemed. As already explained, this convergence reflects the continuous addition of accruing interest and not an increase in price. Nominal holding gains or losses occur only when market rates of interest change and these obviously need not be reversed. For example, a one-off holding gain (loss) for the holder simply means that the total interest received over the life of the security is correspondingly reduced (increased).

***Shares and other equity* (AF.5)**

Shares are different from most other financial assets in that they do not entitle their owners to a pre-determined income or to a fixed sum on the dissolution of a corporation. The prices of shares are determined by general market forces and the stock market's assessment of the prospects for the individual corporation concerned. Changes in the market prices of shares generate nominal holding gains or losses for their owners.

## INDEX LINKED LOANS AND SECURITIES

### *Index linked loans*

In situations of chronic or high inflation, loans are commonly index linked. The amount of the principal outstanding is periodically increased, by mutual agreement between the creditor and the debtor, in proportion to the change in some price index or the price change for some specified commodity. Such an increase is quite different from the automatic revaluation of a non-financial asset that occurs whenever its own market price changes. As explained earlier, a loan has no price of its own. Deliberately writing up the amount of the principal requires new transactions to take place between the two parties to the loan. The principal cannot be increased without the increase in the loan being recorded in the financial accounts of both parties. Under the terms of the indexing agreement, however, this additional lending is implicitly financed out of a transfer of equal value made by the debtor to the creditor and recorded in their capital accounts.

The transfer constitutes payment of compensation for the creditor's real holding loss on the currency lent to the debtor. The payment of compensation can be treated as a special category of capital transfer, similar to those recorded under item D.99 in the capital account (see paragraphs 10.139 to 10.141 of the 1993 SNA). As already noted, writing up the amount of a loan as a result of an indexing agreement is the opposite of debt foregiveness, which is recorded in the accounts in a similar way (see paragraphs 10.139, 10.141 and 11.23 of the 1993 SNA). The payment of compensation by the debtor is the whole point of an indexation agreement which is designed to protect the creditor's net worth in real terms.

In the absence of other transactions, the only entries required in the flow accounts in respect of an index linked loan are the payment of compensation in the capital accounts of both parties and the matching lending/borrowing in the financial accounts. It is important also to consider the opposite case of an indexed loan that is taken out and repaid within the same period. Suppose, for example, that a short term indexed loan is taken out to finance the holding of inventories or work-in-progress. Under high inflation the amount repaid may be several times larger than the amount borrowed. The increase in the principal due to indexation requires the same two entries as just described. In addition, the initial lending/borrowing and repayment is also recorded in the financial accounts of both parties. However, the sum of initial lending plus the additional lending out of the compensation paid must be equal to the final repayment so that all the entries in the financial account cancel out for both parties. Thus, the entries for lending and borrowing sum to zero for the period as a whole. There must also be zero entries in the opening and closing balance sheets assuming the loan is taken out and repaid within the same period. Two items remain, however, that are not zero. The first is the payment of interest in the primary income account while the second is the payment of compensation recorded in the capital account. Both would be payable in cash. The amount payable as compensation may be expected to be very much larger than the interest, which would, in effect, be real interest. The capital, or financing, costs of holding the inventories or work-in-progress consist of both items combined and not only the interest payable. Both should be charged against the nominal holding gains accruing on the inventories or work-in-progress.

When there is no inflation, the capital or financing costs of assets used in production consist only of the interest charges recorded in the primary income accounts, nominal and real interest coinciding in the absence of inflation. On the other hand, when there is inflation, especially high inflation, and assets are financed out of index linked loans it is clear that the bulk of the capital cost is likely to be the payment of compensation for the creditor's real loss. This cost has to be recorded in the capital accounts of both parties, just as the associated nominal holding gains on the assets they finance are recorded in the accumulation accounts and not in the current accounts. This point is developed further in the chapter on the production account.

**Index linked securities**

Under high inflation there may be little demand for long term bonds or similar securities, unless there is some form of index liking. A promise to pay a fixed sum of money at some distant future date can have little current value when high rates of inflation are expected to reduce its real value almost to zero by the time it is paid. Discounting long term bonds, especially the deep discounting of zero coupon bonds, cannot be attractive to lenders when the currency is expected to depreciate substantially, unless the principal is index linked. Alternatively, coupon interest may be payable each period with the interest payments being index linked instead of the principal. Index linked interest payments obviously do not generate holding gains and their treatment is discussed in Chapter 7.

As in the case of index linked loans, each increase in the par value of a bond as a result of index linking requires new transactions between the issuer and the current holder. The issuer, or debtor, makes a capital transfer to the current owner which the owner lends back again to the issuer. The first transaction is recorded in the capital accounts of both parties and the second in their financial accounts under the heading *securities other than shares*. The amount to be recorded is the increase in the face value resulting from the index linking. No nominal holding gains are generated by the index linking.

During the course of the accounting period, however, the market price of an indexed bond may change by a different amount from that required by the index linking because of other factors, such as changes in market rates of interest or the accumulation of reinvested interest on a discounted bond. As in the case of ordinary bonds that are not indexed, changes in the market prices of indexed bonds caused by changes in market rates of interest give rise to nominal holding gains or losses.

**CLAIMS IN KIND**

In general, when the two sides of an exchange take place on different dates, two separate transactions have to be recorded with one party having a claim over the other in the intervening period. As explained in the Annex to Chapter 2, when the exchange is a barter the party making the first delivery establishes a claim "in kind" whose value need not be constant in money terms. Under high inflation the price of the second item may increase significantly before it is delivered and the claim extinguished. In effect, the value of the claim in monetary terms is index linked to the price of the second item. Claims in kind are not specifically referred to in the 1993 SNA. Implicitly, however, they are covered by *other accounts receivable/payable*, item AF.7 in the classification of financial assets/liabilities.

The accounting treatment of a claim in kind is the same as for an index linked loan. The increase in the monetary value of the claim is recorded as additional lending in the financial accounts of both parties. It is financed out of the payment of compensation by the second party to the first. If the barter is completed within the accounting period, the various entries in the financial accounts cancel out for each party, as in the case described above of an index linked loan that is taken out and repaid within a single period. However, the monetary value of the "resource" credited to the first party to deliver, the "creditor", is less than that of the "use" subsequently debited when the second part of the exchange takes place because of the increase in the price of the second item over the intervening period. The difference between the values recorded in the accounts for the two sides of the barter is reconciled by the compensation payable by the "debtor" to the "creditor" recorded in their capital accounts. Otherwise, the identity between total resources and total uses for the set of transactions accounts as a whole would not hold. No holding gains or losses are generated.

## THE EFFECTS OF ALTERNATIVE NUMÉRAIRES ON HOLDING GAINS

A *numéraire*, as it was called by Walras, is a commodity or entity that serves as a unit of value. Any clearly defined commodity can serve as the *numéraire*. For example, suppose that sugar is chosen as the *numéraire*. The price of a good, service or asset is then given by the number of kilos of sugar for which a unit of that good, service or asset can be exchanged. The total value of a basket of goods and services is given by the total quantity of the *numéraire* for which the complete basket can be exchanged. By definition, the price of a unit of the *numéraire* has to be unity. Relative prices – *i.e.*, the ratios of the prices of different items – are evidently the same, whatever *numéraire* is chosen. They show the rates at which goods, services or assets can be exchanged directly for each other without involving the *numéraire*.

In practice, the basic unit of national currency is almost invariably used as the *numéraire* in business and national accounts. The price of something at a given point of time is then the number of units of national currency for which it can be exchanged at that time. In order to appreciate the role of the *numéraire* on the measurement of holding gains – nominal, neutral and real – it is worth examining the effects of using alternative *numéraires*.

Some illustrative data are shown in Table 5.1 for three different kinds of assets – the national currency, a fixed asset and gold. At time 0, the price of a fixed asset is 10 units of currency while the price of a unit of gold is 50. These prices rise to 40 and 300 respectively by time t. The data are presented in the first three columns of the table in which the national currency serves as the *numéraire*. The general index of inflation rises from 1 to 5 between times 0 and t. For convenience, the quantities of the three assets shown in the first row of the table are chosen so that the value of the stock of each asset at time 0 is the same, namely 100 units of currency. In order to be able to isolate the effects of the various changes in prices, the quantities of the three assets are also assumed not to change between times 0 and t. The nominal, neutral and real holding gains on the three assets between times 0 and t are shown in the last three rows of the table. The formulae used to calculate the holding gains are fully explained in paragraphs 12.68 to 12.78 of the 1993 SNA and paragraphs 1 to 14 of the Annex to Chapter XII.

Given that the national currency is the *numéraire* in this part of the table, it follows that the nominal holding gains on the 100 units of currency held at time 0 must be zero. However, given also the assumed high inflation between times 0 and t, it can be seen that real holding losses of 400 are incurred on the stock of currency. As the balance sheet value of the stock of currency is 100 at both times 0 and t, it is necessary to clarify what are the prices at which these real holding losses are valued. This question is addressed below. In the example, a real holding loss of 100 is incurred by the owner of the fixed asset, while the owner of the gold receives a real holding gain of 100.

In the second three columns of Table 5.1, the same data are presented but with gold as the *numéraire*. The original prices in currency are divided by the price of gold in periods 0 and t to obtain the new prices shown in columns (4) to (6). It can be seen that the price of gold, the new *numéraire*, is unity in both periods 0 and t. The general price index now falls between 0 and t, reflecting the fact that, on average, the prices of other goods and services fell 17 per cent, **relatively** to gold, the new *numéraire* (in terms of currency, the price of gold increased six times whereas the general price index increased five times). Nominal holding losses are incurred on the holdings of both the currency and the fixed asset, as their prices denominated in units of gold actually fell. Neutral holding losses are also incurred. Real holding losses are incurred on currency and the fixed asset, but a real holding gain accrues on gold.

Comparing the results obtained with the two *numéraires*, it can be seen that the real holding gains and losses are the same, except for a scalar, because they depend primarily on changes in relative prices which are independent of the *numéraire*. The real holding gains with gold as the *numéraire* are equal to the original gains divided by the price of gold at time t, namely 300. On the other hand, the nominal holding gains and losses denominated in the two *numéraires* do not bear any simple relationship to each other.

In the third section of the table, a unit of currency of **fixed purchasing power** is used as the *numéraire*, namely a unit of currency at time t. This requires the prices of all assets at time 0, including the price of a unit of currency itself, to be multiplied by five, so that they are expressed relatively ot the

general price level **at time t.** At these scaled up prices, there are no neutral holding gains as the price level is the same at both time 0 and time t. Whatever holding gains occur must be real, the real gains being the same as the nominal in these circumstances.

It can be seen that the real holding gains and losses in the third part of the table also have the same values as in the first part. In fact, they must be identical. Real holding gains are calculated in the third part of the table using the formula:

$$RG = (p_t - p_o \bullet r_{it}/r_o)q$$

Each $p_o$ is scaled up by the increase in the general price level $r_t/r_o$ before being subtracted from p in order to calculate the holding gain on the asset. The real holding gains in the first two parts of the table, on the other hand, are calculated in accordance with the formula given in paragraph 12.77 of the 1993 SNA, namely,

$$RG = (p_t/p_o - r_t/r_o)p_oq$$

By inspection, the two formulae are identical.

The version used in the third part of the table has the advantage that it clarifies the basis on which real holding gains and losses are valued. As holding gains span a period of time during which prices are changing, perhaps rapidly, it is not obvious at what prices the holding gains themselves are valued. It follows, however, from the method of calculating real gains and losses used in the third part of the table that they must be valued at the purchasing power of the currency at time t. This may be illustrated with reference to the real holding losses on currency in the example in the table.

Suppose that the value of the stock of currency held at time 0 had to be maintained intact in real terms. 500 units of currency would be needed at time t to be worth as much as the 100 units actually held at time 0. In practice, only the original 100 units remain at time t, as currency only maintains its nominal value. Thus, it is clear that the real holding loss incurred is equal to 400 units of currency **at the price level of time t**. In effect, four fifths of the real value, or purchasing power, of the original 100 units of currency is lost through inflation. This loss would be valued at only 80 at the prices prevailing at time 0 but is equal to 400 units of currency at time t. 400 is also the value obtained for real holding gains or losses using the standard method of calculation explained in Chapter XII of the 1993 SNA.

The real holding gain on the gold is open to a similar interpretation. Gold to the value of 500 is needed at time t to have the same purchasing power over goods and services in general as the gold to the value of 100 held at time 0. However, the value of the two units of gold held in time 0 is 600 at time t, so that simply by holding on to them a real gain of 100 accrues. It is clear that this gain is expressed in terms of the general price level prevailing at time t.

It may be concluded that real holding gains or losses, not only as defined in the 1993 SNA but as customarily understood in economics, are valued at the general price level prevailing at the end of the period over which they accrue. When the real gain is realised within the accounting period, it is valued at the general price level prevailing at the time the asset is disposed of or used. When the real gain is not realised, it is valued at the price level at the end of the accounting period when the balance sheet is drawn up. Thus, under conditions of high inflation, real gains realised within an accounting period may be valued at prices that are significantly lower, on average, than those for unrealised gains.

It is also clear that unrealised real holding gains and losses are not valued consistently with flows taking place within the period which are implicitly valued at some kind of average prices for the period and not at end of period prices. This needs to be taken into consideration, at least under conditions of high inflation, if an expanded concept of income incorporating real holding gains and losses is proposed.

## CONCLUSIONS

The following conclusions may be drawn about the effects of *numéraires* and the valuation of holding gains and losses.

1. The values of nominal holding gains or losses are strongly influenced by the choice of *numéraire* to the extent that changing the *numéraire* may completely change not only the absolute and relative magnitudes of the gains or losses on different kinds of assets but may even changes gains into

losses, and *vice versa*. Nominal gains and losses therefore need to be interpreted with great care and caution. When the national currency is used as the *numéraire*, the large nominal holding gains typically observed under high inflation may not convey much information about the assets themselves, as they mainly reflect the fact that the general purchasing power of the currency is falling rapidly over time.

2. The relative sizes of the real holding gains and losses on different assets depend only on changes in relative prices and are independent of the *numéraire*. Changing from one *numéraire* to another simply involves multiplying all the real gains and losses by a constant, or scalar.
3. When the unit of national currency serves as the *numéraire*, real holding gains and losses on assets and liabilities are valued at the general price level prevailing at the end of the period covered: that is, when the asset is disposed of or the end of the accounting period, depending on whether the gain is realised or not.

Table 5.1 **Holding gains under alternative numeraires**

| | Currency as numeraire | | | Gold as numeraire | | | Currency in period T as numeraire | | |
|---|---|---|---|---|---|---|---|---|---|
| | Currency | Fixed asset | Gold | Currency | Fixed asset | Gold | Currency | Fixed asset | Gold |
| $q$ | 100 | 10 | 2 | 100 | 10 | 2 | 100 | 10 | 2 |
| $p_o$ | 1 | 10 | 50 | 0.0200 | 0.2000 | 1 | 5 | 50 | 250 |
| $p_t$ | 1 | 40 | 300 | 0.0033 | 0.1333 | 1 | 1 | 40 | 300 |
| General price index | | | | | | | | | |
| $r_o$ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| $r_t$ | 5 | 5 | 5 | 0.8333 | 0.8333 | 0.8333 | 1 | 1 | 1 |
| Nominal holding gain $(p_t - p_o)\, q$ | 0 | 300 | 500 | −1.6667 | −0.6667 | 0 | −400 | −100 | 100 |
| Neutral holding gain $(r_t/r_o - 1)\, p_o q$ | 400 | 400 | 400 | −0.3333 | −0.3333 | −0.3333 | 0 | 0 | 0 |
| Real holding gain (nominal **minus** neutral) | −400 | −100 | 100 | −1.3333 | −0.3333 | 0.3333 | −400 | −100 | 100 |

# 6. PRODUCTION ACCOUNTS

## INTRODUCTION

The production account records the intermediate inputs, consumption of fixed capital and outputs of a process of production. Its balancing item, value added, may be measured either gross or net of consumption of fixed capital. The generation of income account shows the charges that are payable out of value added, namely compensation of employees and taxes on production, with either the operating surplus or mixed income as the balancing item. Subsidies may be treated as negative taxes in this context. It is often convenient to combine the two accounts into a single account as value added is the only resource in the generation of income account.

The two basic rules governing the recording of the entries in the production and generation of income accounts are that:

1. inputs should be recorded at the times they are used and outputs when they are produced; compensation of employees is recorded as the work is done and taxes when the liabilities are incurred;
2. inputs and outputs, including consumption of fixed capital, are valued at the prices prevailing at the times they are used or produced.

It is particulary important to respect the second rule when there is inflation, even moderate inflation. Economic theory requires the costs recorded in the production account to be the opportunity costs of using the resources in question, whether materials or fixed assets. These reflect the value of the output of other goods or services that could be produced by using the resources elsewhere. They are best measured by the current market prices of the materials or assets.

### Historic cost accounting under high inflation

Historic cost accounting is widely used in the business accounts which provide one of the main data sources for national accounts. When there is inflation, the use of historic instead of current cost accounting has three consequences:

1. output is over valued by the nominal holding gains accruing on inventories, including work-in-progress, prior to its sale or disposal;
2. intermediate inputs are under valued by the nominal holding gains accruing on materials or supplies prior to their use in production;
3. consumption of fixed capital is under valued by part of the total nominal holding gains that have accrued on existing fixed assets since the time they were purchased, or otherwise acquired, in the past.

Gross value added is over estimated by the over valuation of output and the under valuation of intermediate consumption. Net value added is over estimated even more when depreciation at historic cost is used instead of consumption of fixed capital at current cost. The bias in gross value added depends only on the recent rate of inflation whereas the bias resulting from the use of historic cost depreciation depends on the cumulative inflation over all the years the assets have been owned. These biasses result from the inclusion of nominal holding gains in "value added" at historic costs. However, the holding gains accrue when the assets are not being used in production and they do not measure value created by production. It is quite wrong, therefore, to treat them as part of value added.

Any nominal gains included with value added are carried forward into the operating surplus. The upward bias is in the operating surplus is bound to be relatively much serious. The operating surplus is intended to measure the profitability of a production process. Historic cost profit, on the other hand, does not differentiate between the operating surplus and nominal holding gains. As historic cost profits may include substantial holding gains due to inflation, they may send completely the wrong signals to users. Historic cost profit may not only exaggerate the profitability of production processes but make unprofitable processes appear profitable.

In order to switch from historic cost accounting to current cost accounting, it is necessary to change the method of recording changes in inventories and depreciation to conform with the accounting rules of the SNA. This may not be easy in practice. The SNA treatment of changes in inventories and consumption of fixed capital under high inflation is explained in some detail later in this chapter.

### Capital costs under high inflation

Although inflation brings large nominal holding gains on assets and materials owned by producers, it also increases the associated costs in monetary terms. The opportunity cost of owning an asset – *i.e.*, the capital cost – is the return that could be earned by investing elsewhere the funds needed to finance its acquisition. Suppose the acquisition is financed by a loan on which the interest is index linked. As explained in Chapters 3 and 8, under high inflation, creditors obtain compensation for the real holding losses they incur on their loans out of the high interest receivable under the indexing arrangement. The payment of the compensation is recorded in the capital accounts of both parties, the remainder of the interest being real interest. Both contribute to the cost of borrowing and both are usually payable in cash, real interest being much the smaller component under high inflation. Together they make up the relevant capital costs to be set against the nominal holding gains on the materials or assets financed out of the loan. The owner of an asset only makes a profit from holding it when the **real** holding gain on the asset exceeds the **real** interest chargeable, the neutral holding gain being cancelled out by the payment of compensation to the creditor.

In the SNA, capital costs can be ignored in the production and generation of income accounts because value added and the operating surplus do not include any nominal holding gains on the inputs used or outputs produced. To use historic cost accounting within the SNA framework, however, would produce completely unbalanced results as the nominal gains would be counted as resources in the production account without the associated capital costs being recorded in the same accounts. It may be noted, incidentally, that it is equally inappropriate to record the capital costs in full (*i.e.*, the whole of the nominal or indexed interest) in the primary income account of the SNA when the associated nominal holding gains are not included as resources anywhere in the current accounts of the system.

## THE RECORDING OF CHANGES IN INVENTORIES AND WORK-IN-PROGRESS

The values of the inputs used in production and the outputs produced usually have to be derived by adjusting the corresponding purchases and sales for changes in inventories. The purpose of the adjustment is not simply to derive the correct quantities but also to ensure that the inputs and outputs are correctly valued. The SNA's valuation rules require both entries to, and withdrawals from, inventories to be valued at the prices prevailing at times they take place. Reference may be made to paragraphs 6.57 to 6.79, 6.151 and 10.96 to 10.115 of the 1993 SNA for an detailed explanation of of the recording of changes in inventories including work-in-progress. Under high inflation a good may be withdrawn from inventory at a price which is several times larger than that at which it entered. In the 1993 SNA, gross fixed capital formation is sub-divided into acquisitions and disposals of fixed assets. It is helpful to make a similar sub-division, at least conceptually, between acquisitions and disposals of inventories, even though the transactions involved are internal to the producer unit. It is then obvious that when a good is put into inventory at one price and subsequently withdrawn at a higher price the value of the acquisition and the disposal do not cancel out so that the monetary value of the change in inventories is not zero even though the quantity change may be zero.

When a good is withdrawn from inventory at a higher price than that at which it entered, a nominal holding accrues to the owner of the enterprise equal to the difference between the two prices. This holding gain cannot be part of the value added as it does not result from productive activity. The SNA's rule that inputs must be valued at the prices current at the times they are consumed, and outputs at the prices when they are produced, is equivalent to valuing the goods in question as if they never spent any time in inventories thereby ensuring that intermediate consumption and output cannot include any holding gains.

**The relationship between the value of changes in inventories and nominal holding gains**

When a good is entered into and withdrawn from inventory in the same accounting period, the value of the change in inventory is equal to the entry price **minus** the withdrawal price, whereas the holding gain is equal to the withdrawal price **minus** the entry price. The two are equal but opposite in sign. On the other hand, when the entries and withdrawals take place in different periods, the situation is more complicated. The change in inventory in the first period is equal to the entry price alone but the nominal holding gain is equal to the value of the good in the closing balance sheet **minus** the entry price. In general, the two are not equal for goods that are held in inventory at the beginning or end of the accounting period, or both. Over a short period of time the value of changes in inventories is likely to be dominated by changes in the quantities of goods held, but over a long accounting period most goods may enter and leave inventories within the same period so that the value is more likely to reflect the incidence of holding gains. Under high inflation, the value of changes in inventories over a long period of time is likely to be negative, its primary function being to adjust the values of purchases and sales for the large holding gains on inventories.

In the Annex to Chapter XII of the 1993 SNA it is shown that for every type of asset:

1. the difference between the values of the stock of a given asset in the closing and opening balance sheets **minus**,
2. the total value of all actual and imputed transactions and other volume changes in the asset taking place during the accounting period is **identical** in value with;
3. the total value of all nominal holding gains accruing on the asset during the accounting period.

In the SNA, assets are valued at their prices at the times the balance sheets are drawn up. This method of valuation, which may be different from that used in business accounts, is essential if the identity is to hold. Changes in inventories are recorded under (2) above as internal transactions.

Using the above identity, the properties of the SNA measure of changes in inventories may be illustrated by some simple numerical examples as set out in Table 6.1. The data refer to the quantities and price of a good held in inventory at end of each quarter, the changes being assumed to take place just before the end of each quarter. To bring out the impact of high inflation, the price is assumed to increase by more than 500% during the year.

There are four sets of illustrative data in the table. In set A, the quantities remain constant throughout, the whole of the increase between the opening and closing balance sheet values being due to holding gains. In set B, the quantities decline steadily throughout, but the value of the inventory actually increases slightly over the year because the nominal holding gains exceed the value of the withdrawals. In set C, quantities are zero at both the start and the end of the period, the inventory being built up during the the first three quarters and run down again in the fourth quarter. Work-in-progress may follow this pattern. For example, in the early stages of agricultural production there may be a steady build up of work-in-progress followed by a run down as the crop is harvested and disposed of. Notwithstanding the fact that the opening and closing balance sheet values are both zero in set C, the change in inventories over the year is negative because the withdrawals are recorded at a much higher prices than the entries. The negative change must be offset by positive nominal holding gains of equal value when the values in the opening and closing balance sheets are equal. Finally, in set D, the opposite kind of fluctuation is shown. In this case, even though the quantities are the same at the beginning and end of the year, the change in inventories has a positive value, the increase in the balance sheet values being split more or less evenly between change in inventories and nominal holding gains.

These examples highlight the extent to which the value of the change in inventories depends on the changes in quantities taking place during the year and not simply the opening and closing quantities. When there are fluctuations in inventories combined with high rates of inflation, the pattern of changes during the year may have much more impact than the net change over the year as a whole. In these circumstances, the opening and closing balance sheet values do not provide nearly enough information to calculate the value of changes in inventories (or nominal holding gains).

In some cases, it may be possible to make rough estimates from balance sheet data alone, provided there are grounds for making a plausible hypothesis about the evolution of the quantities during the period. For example, if it can be assumed that the quantities change at a constant rate over the period, and if the rate of price change is known, it is easy to work out both the change in inventories and the nominal holding gains (see paragraphs 12.93 to 12.98 of the 1993 SNA). Unfortunately, the assumption that inventories grow or decline at a steady rate may not be very realistic when large inventories may be held because of seasonal fluctuations in demand or supply that cause the inventories to fluctuate also.

When inventories are valued in the balance sheets of enterprises at historic cost they have to be revalued at current prices for SNA purposes. The revaluation has to take account of the lengths of time goods have been held in inventories and the way in which they were valued in the enterprise accounts. Nominal holding gains may be estimated as part of the same calculation. It may be extremely difficult to make such estimates in practice and they may not be very reliable. However, leaving the nominal holding gains in value added and the operating surplus is not acceptable for SNA purposes as it violates the fundamental valuation principles of the SNA.

## QUARTERLY PRODUCTION ACCOUNTS AND CPL ACCOUNTS

Under high inflation, accounts have to be compiled for sub-periods of the year, as explained in previous chapters. Even when there is no inflation, quarterly production accounts should receive high priority in a country's statistical system. They are needed to monitor developments in the economy and to keep track of cyclical fluctuations in economic activities. They are compiled by many countries, irrespectively of their rate of inflation. However, the need for quarterly production accounts is even greater under high inflation. They may be compiled for industries – *i.e.*, groups of establishments – as well as for sectors. At the level of the total economy, GDP may, of course, also be calculated quarterly from data on final expenditure or primary incomes.

Shortening the accounting period can make the compilation of production accounts more difficult, however, especially when output is completed only at certain times of the year or produced in large units at irregular intervals. In such cases, there may be a considerable amount of incomplete output in the form of work-in-progress at the start or the end of each accounting period. The measurement of work-in-progress is complex under high inflation and the appropriate accounting treatment is explained in detail in the Annex to the chapter.

When quarterly production accounts are available, constant price level (CPL) accounts, as explained in the previous chapter, can also be compiled. A numerical example of CPL production accounts is given in Table 6.2. CPL accounts are needed most when structural or behavioural changes are taking place between quarters. For this reason, although production slows down in the third and fourth quarters, intermediate consumption and compensation of employees are assumed not to slow down to the same extent so that the net operating surplus switches from positive to negative towards the end of the year.

The original accounts for the four quarters are shown in the upper part of Table 6.2. The general price index, shown in the last row of the table, is the same as that used in the previous chapter and increases five times between the first and fourth quarters. In order to obtain the CPL accounts, all the entries in each quarter are divided through by the general price index for that quarter. The resulting CPL accounts are shown in the lower half of the table with their new annual totals.

The share of compensation of employees in net value added for the year falls from 106 in the original accounts to 92 per cent in the CPL accounts. More striking, however, is the corresponding change in the net operating surplus from –6 per cent to +8 per cent, balancing items being relatively more sensitive to the change in the weighting of the quarters between the original and the CPL accounts. In the first half of the year when about 60 per cent of the production took place, the activity was indeed profitable the net operating surplus being 29 and 17 per cent of net value added in the first and second quarters. However, it fell to –13 and –30 per cent in the third and fourth quarters. In the original accounts, the annual net operating surplus is negative because the annual accounts are dominated by the high values in the accounts for the second half of the year, even though well under half of the production took place then. In the CPL accounts, on the other hand, the net operating surplus for the year is positive because of the profitable production in the first half of the year. The CPL account for the year captures the fact that the production was profitable, on balance, by giving equal weight to production in all four quarters by recording it at the same general price level throughout the year. Another way of interpreting the results is to note that the purchasing power – the command over real resources – of the operating surplus earned in the first half of the year (75 at mid-year prices) was more than twice as large as that of the loss incurred in the second half (–36 at mid-year prices).

### Output as work-in-progress

One complication of compiling quarterly production accounts is that the estimation of work-in-progress beomes relatively more important. For certain types of production, such as agricultural production, the entire output for a given quarter may consist of work-in-progress. The way in which such output may be measured is explained in paragraphs 6.72 to 6.79 and 6.94 to 6.100 of Chapter 6 of the 1993 SNA.

When there is high inflation, however, it may become necessary, even when compiling the annual accounts, to take explicit account of work-in-progress during the course of the year, despite the fact that the entire production process, such as the planting and harvesting of a crop, may be completed within the year (see paragraph 19.72 of the 1993 SNA). As explained above, when inventories, including work-in-progress, are built up from zero and run down to zero again within the same year, the values of the changes in inventories do not cancel out when there is inflation because the additions to inventories are recorded at lower prices than the subsequent withrawals. For the year as a whole, the value of changes in inventories must be negative under the conditions assumed. If these changes are not recorded, substantial holding gains may be inadvertently included in the value of output, value added and the operating surplus thereby introducing major biasses into the accounts.

The appropriate accounting procedures for handling work-in-progress under high inflation are complicated. They are therefore elaborated in a separate Annex to this chapter where a detailed numerical example is worked out. The example illustrates that the errors caused by failing to take account of the changes in work-in-progress and the associated nominal holding gains under high inflation may be so large as to render the accounts completely unacceptable and unusable.

## CONSUMPTION OF FIXED CAPITAL

The definiton and accounting treatment of consumption of fixed capital is given in section I of Chapter VI of the 1993 SNA, paragraphs 6.179 to 6.203 and also paragraphs 12.101 to 12.104 of Chapter XII. The accounting rules governing the recording of consumption of fixed capital are robust enough not to require modification under high inflation, although they may become more difficult to implement in practice.

Consumption of fixed capital is intended to measure the opportunity cost of using fixed assets in production. It is not an accounting device for allocating the costs of expenditures on fixed assets over succeeding time periods. It is defined as the decline, over the course of the accounting period, in the **current** value of the stock of fixed assets owned and used by a producer as a result of their physical deterioration, normal obsolescence and normal accidental damage (paragraph 6.179 of the 1993 SNA). The value of a fixed asset depends on the present value of the stream of benefits that can be derived from using it in production. In practice, this value may be approximated either by its market price, if

proper markets exist on which the used assets are traded, or by the price of a new asset written down by cumulative consumption of fixed capital up to that point of time. As explained in the 1993 SNA, it may be necessary to build up estimates of the complete stocks of fixed assets using the perpetual inventory method (PIM) in order to calculate capital consumption. Because this may be difficult, especially under high inflation, the 1993 SNA recognises that estimates of the stock of fixed assets and consumption of fixed capital may not always be available. Provision is therefore made in the system for the various balancing items in the transactions accounts to be measured either gross or net of consumption of fixed capital.

The accounting identity linking the values in the opening and closing balance sheets is as follows.

The value of the stock of an asset in the opening balance sheet

**plus** the value of gross fixed capital formation (acquisitions **less** disposals of the asset)

**minus** consumption of fixed capital

**plus** "other" volume changes in the asset

**plus** nominal holding gains on the stock of the asset

**equals** the value of the stock of the asset in the closing balance sheet.

In order to estimate consumption of fixed capital at current prices, the first step is to estimate the fraction of the value of the asset to be written off during the year. As explained in paragraphs 6.190 to 6.198 of the 1993 SNA, this fraction depends the pattern of the flow of services that the asset is expected to contribute to production over the rest of its life. The two most common conclusions are that the asset should be written down at a constant linear rate or a constant percentage rate.

From an accounting view point, consumption of fixed capital can also be interpreted as measuring the total value of a series of transactions internal to the producer unit in which the fixed asset is gradually disposed of. Under high inflation, the prices at which these internal transactions are taking place must be rising rapidly in the same way as other prices. The fraction of the asset that is to be written off should therefore be applied to the average value of the asset during the year rather than its value at the start or end of the year. In this way, the value of capital consumption is recorded consistently with other flows in the accounts. The fraction to be written off should therefore be applied to the value of the asset in the opening balance sheet increased by the ratio of the average price of a new asset during the period to its price at the start of the period.

In the case of an existing fixed asset for which there is no "other" volume change, the closing balance sheet value can be estimated from the opening value in two steps. First, the opening balance sheet value should be reduced by the fraction to be written off as consumption of fixed capital in order to calculate a provisional closing value on the assumption of no price change. Second, this provisional closing value should then be increased in proportion to the increase in price of a new asset between the beginning and end of the period, or the increase in some appropriate price index used as a proxy. The value of the nominal holding gain on the asset may then be derived residually using the above accounting identity. It is equal to the difference between the closing and opening balance sheet values **plus** the capital consumption, both estimated as just described. Under high inflation, the difference between the opening and closing values is likely to be dominated by the nominal holding gains rather than capital consumption. Suppose, for example, an existing asset has only four years of service life left at the start of the year and that a quarter of the asset has to be written off. Suppose further that the price of a new asset rises 5 times between the beginning and end of the year and that its average price during the year is 3 times its price at the beginning. It the value of the asset in the opening balance sheet is 40, we have:

1. capital consumption = 0.25 (3 times 40) = 30
2. closing balance sheet value = 0.75 (5 times 40) = 150
3. nominal holding gain = (150 – 40) + 30 = 140.

If historic cost accounting is used to calculate consumption of fixed capital when there has been chronic inflation over a number of years, the resulting estimates are likely to be only a minute fraction of the costs of using the capital assets at current prices. For example, even if prices only double each year

simple arithmetic shows that prices are thirty times higher than they were five years earlier and one thousand times higher than they were ten years earlier. In such circumstances, to relate the fraction of the asset to be written off to prices of assets five or ten years earlier is futile and pointless.

### Consumption of fixed capital for sub-periods

When production accounts are calculated quarterly or monthly capital consumption has to be calculated for these sub-periods also. The procedures outlined above for estimating capital consumption are applicable whatever the length of the accounting period. Indeed, they may be easier to implement the shorter the accounting period. Consumption of fixed capital is likely to occur at a fairly even rate during the year, bearing in mind that it is not only attributable to physical wear and tear. Nevertheless, it is preferable to calculate it for each separate quarter in turn rather than to allocate a single estimate for the year as a whole among the four quarters.

## PRODUCTION ACCOUNTS AT CONSTANT INTRA-PERIOD PRICES, OR CIP ACCOUNTS

As noted in Chapter 3, CIP accounts in which the individual flows in the production and generation of income account are valued at their own constant prices may be compiled in addition to the CPL accounts. They may be calculated using any set of prices, but the average prices for the year as a whole or mid-year prices are the obvious choices.

A numerical example of CIP accounts is given in Table 6.3. It is based on the same data as were used in Table 6.2 revalued at mid-year prices. To make the example more illuminating, two alternative sets of figures are shown for output and hence for value added and the operating surplus. The first set, described as "output 1", assumes that the price of output was falling through the year **relatively** to both the general price level and the input prices. Conversely, "output 2" assumes that the relative price of output was rising. The two sets are used below, together with the CPL accounts in Table 6.2, to show how these changing relative prices lead to trading gains or losses.

The annual CIP and CPL accounts are similar to each other because both accounts are based on the middle of the year. As compared with the unadjusted annual account, both convey the same message, namely that the original account underestimates the profitability by giving too much weight to the unprofitable production towards the end of the year. The net operating surplus comes out at about 40 in both the CIP accounts and the CPL account, compared with –30 in the unadjusted account. However, when both the CIP and CPL accounts are available it is possible to use them to calculate trading gains and losses by comparing them with each other.

## TRADING GAINS OR LOSSES ON PRODUCTION

International trading gains and losses are explained in Section K of Chapter XVI of the 1993 SNA, paragraphs 16.148 to 16.156. In the context of production, trading gains and losses may be defined as follows:

$$T = \frac{(O-I)}{P} - \left\{\frac{O}{P_O} - \frac{I}{P_I}\right\}$$

where:

O = output at original prices
I = inputs at original prices
$P_o$ = the price index for output
$P_I$ = the price index for inputs
P = the general price index.

Inputs may be defined either as intermediate plus capital consumption or as these two plus compensation of employees. Using the first definition, the trading gains relate to value added while on the second they relate to the operating surplus. The trading gains or losses are derived by subtracting the CIP figure for value added, or the operating surplus, from the corresponding CPL figure. The results are shown in the lower part of Table 6.3.

Consider, for example, the trading gain between the reference point, the middle of the year, and the fourth quarter using "output 1". The first term in the above expression (O – I)/P is the CPL fourth quarter net value added of 80 shown in Table 6.2. The second term is the CIP fourth quarter net value added of 91 shown in Table 6.3. The difference of –11 between the 80 and the 91 measures the trading loss.

Trading gains and losses need careful interpretation. Firstly, they relate to gains or losses accruing over a particular interval of time, here between the middle of the year, which serves the reference point, and the relevant quarter. Secondly, they are measured using the currency unit at the reference point as the *numéraire*. Under high inflation, shifting the reference point backwards or forwards to the beginning or end of the period would greatly reduce, or increase, the absolute values of the gains or losses. Thirdly, when they are calculated backwards in time, trading gains carry a negative sign and losses a positive sign. If a trading gain occurs in moving from A to B, reversing the movement by going back from B to A results in a loss. Thus, the entries in Table 6.3 for the first and second quarters show the gains that would have resulted by going back from the middle of the year to the earlier quarters. To obtain the gains or losses in a forward direction, the signs for the entries for the first and second quarters need to reversed. Thus, in practice, trading losses are incurred in all four quarters with "output 1", as would be expected since the relative price of the output is falling throughout. Conversely, trading gains occur in all four quarters with "output 2". It is legitimate, therefore, to cumulate the absolute values of the gains and losses in Table 6.3. The total losses for the year for value added with "output 1" are 27, while the total gains with "output 2" are 44. These gains or losses are valued at the general price level prevailing in the middle of the year. Very similar results are obtained for the operating surplus.

Trading gains or losses calculated by subtracting CIP measures of value added from the CPL measures show how much greater or smaller net value added **would have been** if the prices of the inputs and output had all increased at the same rate as the general price index. The magnitudes of the gains or losses thus depend upon the magnitudes of the changes in the **relative** prices of the inputs and the outputs. As noted in the previous paragraph, they also depend on whether they are calculated at the price level ruling at the beginning, middle or end of the year. If they are to be compared with the original unadjusted data, however, mid-year prices seem appropriate, as in the example.

Trading gains or losses reflect the redistributive effects of inflation resulting from differential price movements. Assuming the quantities of inputs and outputs are not affected, above average output price increases benefit a producer, as do below average input price increases. The *proviso* that quantities remain unchanged is, of course, important and may be unrealistic. Trading gains are hypothetical constructs and do not represent some kind of additional "bonus" as the operating surplus already reflects them. For example, using "output 2" above, the trading gain of 40 for the operating surplus for the year shows that the CPL or CIP estimates of the operating surplus are 40 higher than they **would have been if** the price of output had merely kept pace with inflation, assuming unchanged quantities of inputs and outputs.

*Annex* 6.1

# HOLDING GAINS ON WORK-IN-PROGRESS

## WORK-IN-PROGRESS WITH STABLE PRICES

First, it is useful to recall the treatment of work-in-progress when prices remain stable. When the production process spans two or more accounting periods, the SNA requires the value of the finished output to be allocated between the periods concerned in proportion to the costs of production incurred in each period (see paragraphs 6.72 to 6.79 of the 1993 SNA). When the accounts are drawn up after the production has finished, the allocation is relatively simple. If work-in-progress has to be calculated in advance while the production is still in progress and before the price of the final product is known for certain, work-in-progress may be provisionally calculated on the basis of the costs of production incurred each period with an estimated mark-up and then revised subsequently when the actual price of the final output, and hence the operating surplus, is known (see paragraph 6.78 of the 1993 SNA). If the mark-up cannot be estimated, the provisional calculation can be made on the basis of production costs alone (*i.e.*, zero mark-up).

## WORK-IN-PROGRESS WITH INFLATION

When there is high inflation, the prices of both the inputs and the finished output may be expected to rise appreciably during the course of a long production process. Many costs will have been incurred when prices were much lower than at the time the output is completed so that the difference between the value of the finished output and the total costs incurred does not simply measure the value added created by production, but also reflects the rise in the output price over time. In these circumstances, the output has to be recorded as being produced in stages in the form of work-in-progress so that some output can be attributed to the inputs incurred at each stage of the production process. Each segment of work-in-progress can then be valued at the same price level as the inputs used to produce it.

Once again, it is convenient to explain the detailed accounting treatment with the help of a numerical example. The basic data are set out in Table 6.4. It is assumed that it takes four quarters to produce finished output. Output is assumed to be valued at basic prices, as recommended in the 1993 SNA, and there are no taxes on production other than taxes on products. The same rate of inflation is assumed as in previous examples so that the general price index based on the middle of the year increases from 50 to 250 between the first and fourth quarters. In the first part of the table, the original data on costs and sales are recorded. The entire accounts have to be assembled from this information. Without data in this degree of detail the production account cannot be compiled under high inflation, not merely for the individual quarters but also for the year as a whole. For convenience, the basic data in the first part of the table are the same as those already used in Table 6.2 with important exception that the entire output is sold *en bloc* at the end of the fourth quarter instead of quarter by quarter. The receipts from sales are also much higher as the sale takes place when the general price level is highest. In the second part of Table 6.4, these same data are recalculated at each individual input's own fourth quarter price or wage rate (as distinct from at the general price level of the fourth quarter).

The calculation and allocation of work-in-progress, output, value added and the operating surplus (or mixed income) is shown in Table 6.5. The steps involved are the following.

1. In accordance with SNA rules, each quarter's output, *i.e.*, the addition to work-in-progress, must be valued at the prices or costs at the time. Each addition, shown in line 2 of the table, is measured

by the total costs of production incurred in that quarter as given in Table 6.4. No mark-up for the operating surplus, as yet unknown, is added at this point. The mark-up is added later in a second round of calculations.

2. When the production is completed in the fourth quarter the stock of work-in-progress is run down by being transformed into the finished product (see paragraphs 6.76 and 10.105 of the 1993 SNA). In accordance with SNA rules, the run down must be valued at the prices prevailing at the time it takes place. This value may be estimated from the data in the lower part of Table 6.4 in which the costs of production incurred in the previous three quarters are revalued at the prices and wage rates of the fourth quarter. The withdrawal from work-in-progress is thus equal to the total costs of production incurred throughout the entire production process valued at fourth quarter prices and wage rates, 2 325 in the numerical example.
3. The value of the change in inventories or work-in-progress for the year as a whole is equal to total additions minus total withdrawals, namely –1 195 or (1 130 – 2 325) in the example.
4. The value of output for the year as whole is given in the normal way by sales plus the change in inventories; namely, 1 305 or (2 500 – 1 195). The output is allocated by quarters in row 5 of Table 6.5. In the first three quarters it is equal to the addition to work-in-progress, as previously calculated, while in the fourth quarter it is equal to the sales plus the addition to work-in-progress minus the withdrawal; namely, 715 or (2 500 + 540 – 2 325). This method of calculation treats the operating surplus as accruing entirely when the sale takes place and therefore values it at fourth quarter prices.
5. Net value added and the operating surplus can now be calculated for each of the quarters and the year following normal SNA rules. The results are shown in rows 6 and 7.

The nominal holding gains on the work-in-progress are easily derived from the data in Tables 6.4 and 6.5. They provide the key to understanding the whole accounting process. The holding gain on the work-in-progress completed in the first quarter is equal to its value when it is withdrawn in the fourth quarter **minus** the value at which it entered; namely, 510 or (635 – 125), these numbers being given in Table 6.4. The nominal holding gains on the work-in-progress completed in the second and third quarters are calculated similarly. They are shown in row 8 of Table 6.5. The total value of the holding gains for all three quarters is equal 1 195.

The total holding gains are equal in value to the change in inventories or work-in-progress but with the opposite sign. As explained earlier in this chapter, they must be equal in the special case where the opening and closing balance sheet values are the same (here both are zero).

In order to calculate output, the receipts from sales of 2 500 are reduced by 1 195, the negative value of the change in work-in-progress for the year as a whole. The 1 195 is recorded in the capital account under item p. 52, *changes in inventories*. In effect, 1 195 of the – 2 500 is recorded as **receipts from the disposal of inventories instead of from the sale of output**. All the balancing items in the accounts from value added through to saving are reduced by 1 195.

As the nominal holding gains are realised when the production process is completed and the output sold they must be valued at the price level of the fourth quarter (see Chapter 5 above). Similarly, the net operating surplus is treated as accruing in the fourth quarter and is also valued at fourth quarter prices. Thus, the accounts for the year as a whole, shown in the final column of Table 6.5, still present a somewhat unbalanced picture as the entries for the fourth quarter, which quite unrepresentative of the year as a whole, carry too much weight. It is therefore necessary to take the accounting procedures one stage further by calculating the constant price level (CPL) accounts for the four quarters and the year. The CPL accounts with all the various entries in Table 6.5 revalued at the mid-year price level are shown in Table 6.6.

The entries in Table 6.6 are obtained by dividing all the entries in the column for each quarter in Table 6.5 by the same general price index as was used previously in Table 6.2 from where the basic data were borrowed. The totals for the year in Table 6.6 are obtained by summing the revalued figures for the four quarters. The most striking feature of the data in Table 6.6 is that the value of the total additions to work-in-progress is more or less cancelled out by the value of the withdrawals, the change in

work-in-progress for the year as a whole being only –2. If the prices of the various inputs all increased at exactly the same rate as the general inflation, the value of changes in work-in-progress would have to equal zero, as the deflated input prices would be constant throughout the year. The other point to note in Table 6.6 is that the share of the operating surplus in net value added is almost halved, being reduced to 13.5 per cent, as compared with 24.3 in Table 6.5. This reflects the fact that, in Table 6.5, the whole of the operating surplus is treated as accruing at the inflated prices of the fourth quarter, whereas in Table 6.6 it is calculated at mid-year prices.

The figure of 13.5 per cent is the best estimate of the share of operating surplus in value added. It is equal to a mark-up of 6.5 per cent on total production costs. With this information it is possible to finalise the calculations by adding a mark-up of 6.5 per cent to the total cost of production in each quarter to obtain improved estimates of the addition to work-in-progress and then repeating the entire set of calculations. The row for additions to work-in-progress in Table 6.5 is multiplied through by 1.075 and the subsequent calculations carried out as before. The results are shown in Table 6.7. When the correct mark-up is used the value of the withdrawals from work-in-progress in the fourth quarter is equal to the price at which the good is sold. Output is therefore equal to the addition to work-in-progress in each of the four quarters. For the year as a whole, output, value added and the operating surplus are all reduced by 90 as compared with the figures in Table 6.5 because adding the mark-up increases the (negative) value of the withdrawals from work-in-progress in the fourth quarter by more than it increases the additions in the previous three quarters. Conversely, the value of the nominal holding gains on the work-in-progress put in place in the first three quarters increases by 90. The net operating surplus is equal to 13.5 per cent of net value added not only for the year as a whole but also in each of the four quarters individually. The accounts in the upper half of Table 6.7 constitute the best estimates that can be made of the quarterly and annual production accounts at current prices on the basis of the original data on costs and sales given in Table 6.4.

In the lower half of Table 6.7 the CPL accounts are similarly revised to incorporate the 6.5 per cent mark-up. The annual totals remain the same as in Table 6.6, but output, value added and the operating surplus are allocated over the four quarters in a better way. In particular, the net operating surplus is distributed over all four quarters instead of being treated as accruing only in the fourth quarter.

The calculations are complicated, but this is not a serious objection given the availability of computers. The real problem is to obtain basic data in sufficient detail to be able to proceed with the calculations. Nevertheless, the numerical illustration demonstrates the necessity to take account of changes in work-in-progress during the course of the accounting period when there is high inflation. If the changes were to be ignored on the grounds that there is no work-in-progress at the beginning or the end of the period, the accounts would be completely distorted and highly misleading. Ignoring the intra-period changes in work-in-progress, the value of output would be equated with sales, namely 2 500 in the example, whereas in fact more than half of the sales receipts come from the disposal of work-in-progress on which nominal holding gains of 1 285 are realised. Output is valued at only 1 215. While an error of 1 285 in the value of output is serious enough in itself, the consequences for net value added and the operating surplus are quite disastrous. Net value added would be estimated as 1 915 instead of 630 and the net operating surplus as 1 370 instead of 85. Such grotesque errors make accounts totally unacceptable.

From an economic viewpoint, it is also essential to recognise the large nominal holding gains that accrue on work-in-progress. There are many types of production with long periods of production for which the example considered here is highly relevant under conditions of high inflation. In particular, it fits a lot of agricultural production for which the output consists of work-in-progress which is only transformed into the final product when the crop is harvested, timber felled or the livestock slaughtered.

It might be argued that, for business purposes, only actual cash flows matter and that calculating the nominal holding gains on work-in-progress is an unnecessary complication. In the example, since the receipts from sales of 2 500 are so much larger than the total costs of 1 130 (intermediate and capital consumption of 585 plus compensation of employees of 545) it seems superficially that the activity must have been highly profitable. Distinguishing profits in the form of operating surplus from nominal holding gains may be thought to be an unnecessary refinement. However, as noted in Chapter 5 and in the

introduction to this chapter, it is particulary important to take account of the capital costs of financing inventories, including work-in-progress, under high inflation. When there is no inflation, these costs are simply the explicit or implicit interest charges on the capital required to finance the production. When there is high inflation, however, the capital costs also include the much larger amounts needed to compensate for the real holding losses on the funds, whether borrowed or not.

Consider, for example, the work-in-progress produced in the first quarter and suppose that the production costs of 125 are financed by means of an index linked loan taken out sometime in the first quarter and repaid towards the end of the year. If the principal of the loan is linked to the general price index used in the example, the amount to be repaid would be about 625, the exact amount depending the precise timing of the borrowing and repayment. As explained in Chapter 5, additional lending of 500 is financed out of the 500 recorded in the capital account as being received from the producer as compensation for the creditor's real holding loss, so that net lending is zero for the year as a whole. From the producer's point of view, the 500 payable as compensation is counterbalanced in the capital account by the 549 received by disposing of the work-in-progress at a much higher price than it cost (the initial addition of 134 **minus** the subsequent withdrawal of 683). A nominal holding gain of 549 is realised which is needed to cover the payment of compensation. From the point of view of both economic theory and business practice, nominal holding gains have to be reduced by the amount of the associated capital costs before they can considered as some kind of profit. It is therefore essential to identify the nominal holding gains on the work-in-progress so that they can be deducted from the value of sales and not counted as part of output, value added, the operating surplus and disposable income.

### WORK-IN-PROGRESS SPREAD OVER TWO OR MORE ACCOUNTING PERIODS

Many production processes are carried forward from one accounting period to the next, such as major construction works. Even if the process of production is not lengthy, the accounting period may happen to end before it is finished so that the work-in-progress up to that point has to be explicitly accounted for. If the accounting period is the calendar year, even annual crops straddle two accounting periods in the southern hemisphere.

Once the production accounts for the various quarters or sub-periods have been calculated, their allocation to different years is straightforward. The data shown in Table 6.7 may be re-used for the purposes of illustration. Suppose the first two quarters fall in one year and the second two in the following year. The accounts for the two years are shown in Table 6.8. In general, the data for the two years are obtained simply by adding together the data for the two quarters. This is legitimate when the values of work-in-progress, output, value added and the operating surplus have been properly calculated, as in Table 6.7. The new figure in Table 6.8 is the value of the work-in-progress shown in the closing balance sheet for the first year and the opening balance sheet for the following year. This is calculated by valuing the additions to work-in-progress in the first two quarters at the prices prevailing at the end of the second quarter which now coincides with the year's end. This is the same point of time as was used to calculate the CPL accounts previously. Prices are assumed to double between the middle of the first quarter and the year's end and to increase by 25 per cent between the middle of the second quarter and the year's end. The figure of 537 for the balance sheet value of work-in-progress is obtained on these assumptions. With the aid of this figure the nominal holding gains can be allocated between the two years, as shown in the final row of the table. The nominal holding gain for the first year is equal to the closing balance sheet value **minus** the additions to work-in-progress in the two quarters (537 – 349), while that for the second year is equal to the value of withdrawals **minus** both the opening stock and the additions during the second year (2 500 – 537 – 866).

It is worth noting that the change in work-in-progress is no longer equal to the value of the holding gains for either of the two years taken separately. The reason is that the opening and closing balance sheet values for work-in-progress are no longer the same for either year. In the first year the opening value is zero but the closing value is 537, and *vice versa* for the second year. For example, following the basic accounting identity referred to earlier, nominal holding gains in the first year are equal to the difference between the closing and opening balance sheet values (537 – 0) **minus** the value of the imputed transactions for work-in-progress (349).

Table 6.1 **Quantities and prices of inventories held at end of each quarter**

| | | Quarters | | | | | Year | Balance sheet values | |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | | Opening | Closing |
| Price | | 0.4 | 0.5 | 0.8 | 1.25 | 2.5 | | | |
| A | Quantity | 100 | 100 | 100 | 100 | 100 | 0 | | |
| | Change in inventories | 0 | 0 | 0 | 0 | 0 | 0 | | |
| | Nominal holding gains | | 10 | 30 | 45 | 125 | 210 | | |
| | | | | | | | | 40 | 250 |
| B | Quantity | 100 | 80 | 60 | 40 | 20 | | | |
| | Change in inventories | 0 | −10 | −16 | −25 | −50 | −101 | | |
| | Nominal holding gains | | 10 | 24 | 27 | 50 | 111 | | |
| | | | | | | | | 40 | 50 |
| C | Quantity | 0 | 20 | 40 | 60 | 0 | | | |
| | Change in inventories | | 10 | 16 | 25 | −150 | −99 | | |
| | Nominal holding gains | | 0 | 6 | 18 | 75 | 99 | | |
| | | | | | | | | 0 | 0 |
| D | Quantity | 100 | 60 | 20 | 60 | 100 | | | |
| | Change in inventories | | −20 | −32 | 50 | 100 | 98 | | |
| | Nominal holding gains | | 10 | 18 | 9 | 75 | 112 | | |
| | | | | | | | | 40 | 250 |

*Note* Change in inventories = $[(q_t - q_{t-1})\ pt]$
Nominal holding gain = $[(p_t - p_{t-1})\ q_{t-1}]$
The changes in quantities are assumed to occur at the end of each quarter

Table 6.2 **Constant Price Level (CPL) accounts**

| | Quarters | | | | Year |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| | Original accounts at actual prices | | | | |
| Output | 150 | 220 | 250 | 480 | 1 100 |
| Intermediate consumption | 50 | 83 | 102 | 220 | 455 |
| Capital consumption | 15 | 22 | 33 | 60 | 130 |
| Net value added | 85 | 115 | 115 | 200 | 515 |
| Compensation of employees | 60 | 95 | 130 | 260 | 545 |
| Net operating surplus | 25 | 20 | −15 | −60 | −30 |
| | CPL accounts at mid-year prices | | | | |
| Output | 300 | 275 | 200 | 192 | 967 |
| Intermediate consumption | 100 | 104 | 82 | 88 | 373 |
| Capital consumption | 30 | 28 | 26 | 24 | 108 |
| Net value added | 170 | 144 | 92 | 80 | 486 |
| Compensation of employees | 120 | 119 | 104 | 104 | 447 |
| Net operating surplus | 50 | 25 | −12 | −24 | 39 |
| General price index mid-year = 1 | 0.50 | 0.80 | 1.25 | 2.50 | |

Table 6 3 **Constant Intra-Period Price (CIP) accounts**

| | CIP accounts at mid-year prices | | | | |
|---|---|---|---|---|---|
| | Quarters | | | | Year |
| | 1 | 2 | 3 | 4 | |
| Output 1 | 290 | 275 | 205 | 203 | 973 |
| Output 2 | 320 | 280 | 197 | 175 | 972 |
| Intermediate consumption | 103 | 103 | 83 | 87 | 376 |
| Capital consumption | 29 | 28 | 26 | 25 | 108 |
| Net value added 1 | 158 | 144 | 96 | 91 | 489 |
| Net value added 2 | 188 | 149 | 88 | 63 | 488 |
| Compensation of employees | 122 | 120 | 103 | 104 | 449 |
| Net operating surplus 1 | 3 6 | 24 | −7 | −13 | 40 |
| Net operating surplus 2 | 6 6 | 29 | −15 | −41 | 39 |
| **Relative price index: mid-year = 1** | | | | | |
| Output 1 | 1 03 | 1 00 | 0 98 | 0 95 | |
| Output 2 | 0 94 | 0 98 | 1 02 | 1 10 | |
| **Trading gains or losses** | | | | | |
| Net value added 1 | 1 2 | 0 | −4 | −11 | |
| Net value added 2 | −18 | −5 | 4 | 17 | |
| Net operating surplus 1 | 1 4 | 1 | −5 | −11 | |
| Net operating surplus 2 | −16 | −4 | 3 | 17 | |

Table 6 4

| | Quarters | | | | Year |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| | Basic data | | | | |
| Sales | 0 | 0 | 0 | 2 500 | 2 500 |
| Intermediate consumption | 50 | 83 | 102 | 220 | 455 |
| Capital consumption | 15 | 22 | 33 | 60 | 130 |
| Compensation of employees | 60 | 95 | 130 | 260 | 545 |
| Total costs | 125 | 200 | 265 | 540 | 1 130 |
| | At the prices and wage rates of 4th quarter | | | | |
| Sales | 0 | 0 | 0 | 2 500 | 2 500 |
| Intermediate consumption | 250 | 260 | 210 | 220 | 940 |
| Capital consumption | 75 | 69 | 66 | 60 | 270 |
| Compensation of employees | 310 | 290 | 255 | 260 | 1 115 |
| Total costs | 635 | 619 | 531 | 540 | 2 325 |

Table 6 5 **Calculation and allocation of work-in-progress, output, value added and operating surplus**

| | Quarters | | | | Year |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| Sales | 0 | 0 | 0 | 2 500 | 2 500 |
| Additions to work-in-progress | 125 | 200 | 265 | 540 | 1 130 |
| Deductions from work-in-progress | 0 | 0 | 0 | –2 325 | –2 325 |
| Change in inventories | | | | | –1 195 |
| Output | 125 | 200 | 265 | 715 | 1 305 |
| Net value added | 60 | 95 | 130 | 435 | 720 |
| Net operating surplus | 0 | 0 | 0 | 175 | 175 |
| Nominal holding gain on work-in-progress realised in the 4th quarter | 510 | 419 | 266 | 0 | 1 195 |

Table 6 6 **CPL accounts at mid-year price level**

| | Quarters | | | | Year |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| Sales | 0 | 0 | 0 | 2 500 | 2 500 |
| Additions to work-in-progress | 250 | 250 | 212 | 216 | 928 |
| Withdrawals from work-in-progress | 0 | 0 | 0 | 930 | 930 |
| Change in inventories | | | | | –2 |
| Output | 250 | 250 | 212 | 286 | 998 |
| Intermediate and capital consumption | 130 | 131 | 108 | 112 | 481 |
| Net value added | 120 | 119 | 104 | 174 | 517 |
| Compensation of employees | 120 | 119 | 104 | 104 | 447 |
| Net operating surplus | 0 | 0 | 0 | 70 | 70 |

Table 6 7 **Calculation of operating surplus with 7½ per cent mark-up**

| | Quarters | | | | Year |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| Sales | 0 | 0 | 0 | 2 500 | 2 500 |
| Additions to work-in-progress | 134 | 215 | 285 | 581 | 1 215 |
| Withdrawals from work-in-progress | 0 | 0 | 0 | 2 500 | 2 500 |
| Change in inventories | | | | | –1 285 |
| Output | 134 | 215 | 285 | 581 | 1 215 |
| Intermediate and capital consumption | 65 | 105 | 135 | 280 | 585 |
| Net value added | 69 | 110 | 150 | 301 | 630 |
| Compensation of employees | 60 | 95 | 130 | 260 | 545 |
| Net operating surplus | 9 | 15 | 20 | 41 | 85 |
| Nominal holding gain | 549 | 450 | 286 | 0 | 1 285 |
| | CPL | | | | |
| Sales | 0 | 0 | 0 | 1 000 | 1 000 |
| Additions to work-in-progress | 269 | 269 | 228 | 232 | 998 |
| Withdrawals from work-in-progress | 0 | 0 | 0 | 1 000 | 1 000 |
| Change in inventories | | | | | –2 |
| Output | 269 | 269 | 228 | 232 | 998 |
| Intermediate and capital consumption | 130 | 131 | 108 | 112 | 481 |
| Net value added | 139 | 138 | 120 | 120 | 517 |
| Compensation of employees | 120 | 119 | 104 | 104 | 447 |
| Net operating surplus | 19 | 19 | 16 | 16 | 70 |

Table 6 8 **Allocation of data in Table 6.7 between two different years**

| | First year (Qtrs 1 and 2) | Second year (Qtrs 3 and 4) |
|---|---|---|
| Sales | 0 | 2 500 |
| Additions to work-in-progress | 349 | 866 |
| Withdrawals from work-in-progress | 0 | 2 500 |
| Change in inventories | 349 | –1 634 |
| Closing/opening balance sheet values for work-in-progress | 537 | 537 |
| Output | 349 | 866 |
| Intermediate and capital consumption | 170 | 415 |
| Net value added | 179 | 451 |
| Compensation of employees | 155 | 390 |
| Net operating surplus | 24 | 61 |
| Nominal holding gain | 188 | 1 097 |

# 7. INCOME ACCOUNTS

## INTRODUCTION

As a point of departure, it is convenient to take the widely used definition of income suggested by Hicks (*op. cit.*, pp. 173, 174). When prices are stable, Hicks defined income as the "maximum amount which can be spent during a period if there is to be an expectation of maintaining intact the capital value of prospective receipts (in money terms)". After allowing for the possibility of future changes in interest rates, this definition was modified to the following more familiar version: "income is the maximum amount the individual can spend this week, and still expect to be able to spend the same amount in each ensuing week". When prices are expected to change, income is defined as "the maximum amount of money the individual can spend this week, and still expect to be able to spend the same amount *in real terms* in each ensuing week".

Hicks recognised the practical difficulty of measuring an entity that depends not only on expectations of future receipts but also future prices. When expectations are not realised, recorded income, or *ex post* income, may turn out to be greater or less than expected, and Hicks suggested including any resulting "windfall" gains or losses in *ex post* income but not in *ex ante* income. Windfalls may increase or decrease income in future periods but do not enter into the *ex ante* income expected at the beginning of the period, the concept of income deemed to be relevant for decision taking within the period. Hicks was not concerned with *ex post* measures of income which he relegated to "economic and statistical *history*". ... "On the general principle of 'bygones are bygones'" he argued that *ex post* income "can have no relevance to present decisions. The income which is relevant to conduct must always exclude windfall gains ...". As Hicks goes on to acknowledge, however, business and national accounts cannot measure *ex ante* income but they can try to approximate to it by adjusting *ex post* income "in some way that seems plausible or reasonable, for those changes in capital values which look as if they have had the character of windfalls". (*Op. cit.*, p.179.) Such adjustments are needed because expectations of the future income are shaped by observations of past income, so that *ex post* income has to be recorded in business and national accounts in ways which accord as closely as possible with the generally understood concepts. Thus, windfalls are excluded from both the *ex ante* and the adjusted *ex post* income measures according to Hicks. It follows that income as defined in the SNA is broadly consistent with the Hicksian concept of income. In SNA terms, windfalls consist of capital transfers, holding gains and "other volume changes in assets", all of which are excluded from income.

Large inheritances or lottery wins are examples of capital transfers. If the capital transfer is anticipated, as it may well be in the case of an inheritance, it is not a windfall as it will be taken into account in the calculation of *ex ante* income in the same way as any capital already owned at the start of the period. Given that income is intended to measure the maximum rate of consumption that an individual can expect to maintain indefinitely, capital transfers increase income only to the extent that they raise the rate of permanent consumption. They are not available to be consumed in their entirety in the period in which they happen to be received. The increase in the rate of permanent consumption is, of course, only a small percentage of the value of the capital transfer itself, depending on the return that can be expected from investing the capital. However, it can sometimes be difficult in practice to distinguish capital transfers from regular payments or receipts which do not change the expected maximum rate of permanent consumption.

A windfall, as the term is used by Hicks, is an unexpected capital transfer that is not already taken into account when the individual draws up his spending plans at the start of the period. However, a rational, prudent individual will react to capital received through an unexpected transfer in the same way as to capital already owned or anticipated. It would be illogical to consume the whole of the capital received through a windfall in the period in which it is received and expect to be able to maintain that same rate of consumption indefinitely into the future. This is equivalent to saying that the transfer does not in itself constitute income, although it has a marginal effect on the recipient's permanent income. When recording income after the end of the period it makes no difference whether the capital transfer was expected or not. Fortunately, capital transfers do not have to be divided into expected and unexpected in national accounts.

Holding gains and "other volume" changes in assets are also treated as windfalls in the SNA. They have an impact on net worth but do not themselves constitute income. The justification is the same as for capital transfers. Neutral holding gains, as defined in the 1993 SNA, are obviously not income as they do nor increase purchasing power and can have no effect on permanent consumption. Even the recipient of a real holding gain, however, cannot afford to spend the whole of it on consumption in the same period and expect to be able to continue to spend at the same rate in real terms indefinitely in the future.

### INCOME, SAVING AND CHANGES IN NET WORTH IN THE SNA

Income as defined in the SNA is a transactions based concept. It is a function of the actual or imputed values of the transactions recorded in the system's transactions accounts. As explained in Chapter II above, disposable income is a balancing item that can be derived by dividing the integrated transactions account into two parts, as illustrated by the upper dotted horizontal line in Table 2.3. Disposable income is usually obtained as the difference between total resources and total uses above the line utilising data on primary incomes and current transfers. It is also identical in value with the difference between total uses and total resources below the line as recorded in the use of income, capital and financial accounts. Thus, the following identity emerges directly from the integrated transaction account in Table 2.3:

disposable income (net) = final consumption expenditures

**plus** acquisitions *less* disposals of non-financial assets

**plus** acquisitions *less* dispoals of financial assets *less* net incurrence of liabilities

**minus** capital transfers receivable *less* capital transfers payable.

This identity is valid at the level of the total economy. At the level of an individual sector it is also necessary to allow for the fact that the entries under uses and resources for the adjustment for the change in net equity of households in pension funds do not cancel out.

A second important accounting identity in the SNA is that linking values in the opening and closing balance sheets. As explained in the general introduction to the accumulation accounts and balance sheets in Chapter X of the 1993 SNA, the following identity also holds:

the change in net worth between the opening and closing balance sheets

= acquisitions less disposals of non-financial assets

**plus** acquisitions less disposals of financial assets *less* net incurrence of liabilities

**plus** other volume changes in non-financial and financial assets (additions *less* subtractions)

**plus** nominal holding gains *less* losses on non-financial and financial assets and liabilities.

By combining the two identities the following identity is obtained, using some self explanatory abbreviations for the longer expressions used above:

disposable income (net) = final consumption expenditures

**plus** change in net worth

**minus** capital transfers receivable *less* payable

**minus** "other" volume changes in assets

**minus** nominal holding gains *less* losses.

By subtracting neutral holding gains/losses from both the change in net worth and nominal holding gains/losses, the above identity may be restated as follows:

disposable income (net) = final consumption expenditures

**plus** change in real net worth

**minus** capital transfers receivable less payable

**minus** "other" volume changes in assets

**minus real** holding gains *less* losses.

It is sometimes suggested that disposable income should be defined simply as final consumption plus the change in real net worth. This is neither the Hicksian nor the SNA concept of income. Hicks is quite explicit on this point: "The income which is relevant to conduct must always exclude windfall gains; if they occur, they have to be thought of as raising income in future weeks (by the interest on them) rather than as entering into any effective sort of income for the current week." (*Op. cit.* p. 179). In the SNA capital transfers, real holding gains/losses and "other" volume changes in assets are all treated as windfalls which are to be excluded from income even though they affect real net worth.

Finally, it is also useful to clarify the relationship between saving and the change in net worth. Saving is defined in the SNA as disposable income **minus** final consumption expenditures. It follows from the last identity given above that:

saving = change in **real** net worth

**minus** capital transfers receivable *less* payable

**minus** "other" volume changes in assets

**minus real** holding gains *less* losses.

The identity also holds if both the words "**real**" are replaced by "**nominal**".

## THE PRIMARY DISTRIBUTION OF INCOME ACCOUNT

The gross and net operating surplus have already been considered in the context of the generation of income account which is effectively only a further disaggregation of the production account. As explained in the previous chapter, the most important concern under high inflation is to ensure that nominal holding gains on inventories and fixed assets are excluded from value added, and hence from the operating surplus. This chapter is mainly concerned with the other flows in the primary distribution of income account.

Wage and salary rates are frequently linked to an index of consumer prices under moderate or high inflation. However, index linking does not affect the recording of wages and salaries. Following the SNA's normal accounting rules, compensation of employees should be recorded as accruing at the time the work is done. Any back payments of wages or salaries, whether due to the indexing procedure or other factors, should be recorded as payable when the work was done and not when the payment is made.

However, the recording of certain items in the allocation of primary income account, especially interest, is brought into question by high inflation. Changing the treatment of interest also has repercussions on the capital and financial accounts, given that the transactions accounts constitute a closed interdependent system.

### The treatment of interest

First, it is convenient to recall the treatment of interest in the 1993 SNA. Interest is defined as follows (paragraph 7.93):

> "Under the terms of the financial instrument agreed between them, interest is the amount that the debtor becomes liable to pay to the creditor over a given period of time without reducing the amount of principal outstanding."

The principal outstanding is the amount that the debtor must pay to the creditor at any given moment of time to discharge his liability. Notice that the payment of interest arises out of a contractual

agreement between the creditor and the debtor. Whatever changes occur in this agreement affect both parties and have to be accepted, implicitly or explicitly, by both. Such an agreement is ideally suited to indexing under conditions of high inflation.

The recording of interest is relatively straightforward on financial instruments that are not tradeable such as loans and deposits where the original creditor and debtor remain the same throughout the life of the instrument and the debtor makes periodic payments of interest. It is more complicated in the case of instruments that are deliberately intended to be tradeable, in particular bills, bonds and debentures. In these cases, in addition to any periodic cash, or coupon, payments of interest, the difference between the price at which the security is initially issued and the face value at which it is due to be redeemed also constitutes interest. The payment of this interest is recorded in the primary income accounts of both parties and its reinvestment in the security is recorded in their financial accounts. As already explained in Chapter 5, the gradual accumulation of this interest as it accrues over the life of the security constitutes an increase in the amount of the principal outstanding, *i.e.*, an increase in the volume and not the price of the security. On the other hand, when market rates of interest change there are instantaneous inverse changes in the prices of marketable securities which generate nominal holding gains or losses for both the issuers and the current owners of the securities. These price fluctuations cause equal but opposite changes in the amounts of interest accruing over the remaining lives of the securities.

Real holding losses are incurred by creditors on financial assets whose values are fixed in monetary terms as the general price level rises. When inflation becomes chronic, creditors typically react to the systematic real holding losses they expect to incur either by demanding enhanced payments of nominal interest or by linking the interest or the principal of the loan to the increases in some general, or specific, price index.

***Enhanced payments of nominal interest***

If the principal of the loan is not indexed, extremely high rates of nominal interest may be demanded by lenders if they wish to preserve their real net worth in situation of high inflation. If income is to be equal to the maximum sustainable rate of real consumption, real capital must be maintained intact so that only the excess of nominal interest over the real holding loss constitutes income. It is usually described as **real** interest (see paragraphs 7.109 and 7.110 of the 1993 SNA). The nominal rate of interest is determined *ex ante* by lenders expectations of future inflation, but the real rate cannot be fixed in advance (except by index linking) as it depends on the actual rate of inflation realised in the accounting period. If inflation turns out to be higher than expected the real rate may be negative.

The high payments of nominal interest demanded under high inflation are intended to be large enough to offset the creditor's real holding loss on the loan as well as provide a real return, *i.e.*, income. The nominal interest payable and receivable has therefore to be partitioned into two components. The first, and much the larger component under high inflation, constitutes payment of compensation by the debtor to the creditor for the latter's real holding loss. Such payments have to be recorded in the capital accounts of both parties as a kind of capital transfer. The remainder of the nominal interest constitutes property income payable by the debtor to the creditor and should be recorded as real interest in the primary income accounts of both parties.

In the 1993 SNA the whole of nominal interest is treated as property income. This is acceptable when inflation is low and there is not much difference between nominal and real interest. Most economic units may not attach much importance to the distinction or act on it. However, under high inflation by far the greater part of the nominal interest payable may consist of the compensation for the creditor's real holding loss and is perceived as such by both parties to the loan. Nominal interest payments and receipts have to be partitioned to recognise the economic realities.

Partitioning transactions and classifying their components differently is easily accomodated in the SNA. Switching part of a "resource" previously recorded in the primary income account to the capital account reduces the creditor's balance of primary income, disposable income and saving, but not net lending, the balancing item of the capital account. The internal consistency between the financial

account and the other transactions accounts is therefore not disturbed. Reducing income and saving is the objective of the exercise. The other accounts of the system are not affected and the change in treatment from the 1993 SNA is very simple from an accounting point of view.

The creditor's real holding loss may turn out to be larger than the nominal interest receivable so that real interest becomes negative, the direction of the flow being reversed so that, in effect, real interest is payable by the creditor to the debtor. Negative *ex post* real rates of interest have been observed in many countries at one time or another. Indeed, even negative nominal rates of interest have occasionally been observed when banks, or the authorities that supervise them, have sought actively to discourage deposits, at least by certain categories of depositors such as non-residents by requiring them to pay interest to the banks holding the deposits.

There are many types of monetary assets on which no nominal interest is paid, such as currency and many transferable bank deposits. Such assets are not acquired as investments to provide property income but are held for the convenience they provide as a medium of exchange. If the assets are not intended to generate an income they should mot be treated as if they were securities paying a very low rate of interest, namely zero interest. If there is no nominal interest there can be no real interest. It is conceptually incorrect to regard non-interest bearing assets of this kind as paying negative real interest. As inflation increases economic units try to keep their holdings of such assets to the absolute minimum needed to enable them to carry out their transactions.

Transferable deposits on which very low token rates of interest are payable are more problematic. Such deposits may be held primarily for their convenience as a medium of exchange, but competition for deposits between different financial institutions may oblige them to pay small amounts of interest. It is also inappropriate to treat these assets as if they were held as investments intended to generate an income and they should not be treated as if they yielded a negative return. One possibility would be to treat the whole of the token interest as property income. A more appropriate solution may be to apply the ratio of the real to the nominal rate of interest on savings deposits held as investments to the token rates of interest on transferable deposits. For example, suppose transferable deposits pay 4 per cent, savings deposits pay 50 per cent and the rate of inflation is 45 per cent. The real interest on savings deposits is 5 per cent, one tenth of the nominal rate. The real rate on transferable deposits would then be one tenth of 4 per cent, or 0.4 per cent. Of course, if the real rate happened to be negative on the savings deposits, it would also be negative on the transferable deposits. The difference between the nominal and real interest on transferable deposits constitutes partial compensation to depositors for their real holding losses and would be recorded as a transfer in the capital account. This method of calculating real interest on deposits paying only token rates of interest is broadly consistent with the treatment of non-interest bearing assets proposed in the previous paragraph.

### *Index linked interest payments*

When the interest is index linked, the interest payable each year is usually equal to a fixed percentage of the principal plus a further percentage equal to the percentage increase in a designated price index, typically the consumer price index. This arrangement holds the real rate of interest constant. The nominal interest rate is equal to the real rate plus the rate of inflation and therefore varies with the rate of inflation.

The accounting treatment of index linked interest is exactly the same as for the enhanced payments of nominal interest described in the previous section. The index linked component of the nominal interest is patently intended as compensation for the creditor's real holding loss and must be recorded in the capital account and not as property income.

### *Index linked loans and securities*

Index linking the principal of a loan or the face value of a security is slightly more complicated from an accounting point of view than indexing the interest payments or paying enhanced rates of interest under conditions of high inflation, although the underlying principles are exactly the same. The increase in the value of the loan or security resulting from the indexation procedure is accomplished in two

steps. First, the debtor is recorded in the capital accounts of both parties as paying to the creditor an amount equal to the increase in the loan as compensation for the real holding loss incurred by the latter. Second, the creditor is recorded in the financial accounts as lending back to the debtor the amount received in compensation. The increase in the value of the loan or security is due to the increased lending. In any case, as explained in Chapter 5, there can be no nominal holding gain as the "price" of a loan cannot change. The accounting treatment is the same that used whenever the value of loan is written up or down by mutual agreement between the two parties.

As the creditor's real net worth is protected by the payment of compensation under the indexation agreement, the whole of the interest receivable is recorded as property income in the primary income account. If the interest rate is a fixed percentage of the indexed value of the principal, the amount of interest payable in monetary terms will increase from year to year in proportion to the index to which the value of the principal is linked. This kind of increase is similar to the increases in other flows subject to indexation agreements, such as compensation of employees.

Although their accounting treatments may be similar, the cash flow implications of indexing the principal of a loan and indexing the interest, or paying enhanced nominal interest, are quite different. In the latter two cases, the compensation for the creditor's real holding loss is receivable in cash to be disposed of as the creditor wishes, whereas in the former case the creditor is obliged to lend it back again to the debtor. When the principal is indexed, the **real**value of the principal remains constant over time as its nominal or monetary value is periodically increased by the additional lending, whereas when the interest is indexed, or there are enhanced interest payments, the **monetary** value of the principal remains constant over time while its real value declines.

It has been tacitly assumed that when there is index linking, whether of the principal or the interest, the index used is a general price index or consumer price index which is suitable for the calculation of real holding gains or losses. A loan or security may, however, be linked to some specific index or even the price of an individual good. In this case, the amount of the compensation payable by the debtor under the indexing agreement may not equal the real holding loss. There may be some under or over compensation depending on the choice of index. In principle, the amounts of interest payable should be adjusted by the amounts of the under or over compensation to obtain real interest, but in most cases such adjustments are unlikely to be worthwhile in practice, even if they are feasible.

**Interest and real holding gains and losses on monetary assets and liabilities**

Superficially, recording real interest may appear to involve subtracting the creditor's real holding loss from nominal interest to obtain a more appropriate measure of income. If real holding losses on monetary assets are to be taken into account in the income accounts of the SNA, it may asked what is the justification for not taking account of real holding gains and losses on other kinds of assets, including non-financial assets. In fact, this is a misunderstanding and misrepresentation of the accounting procedures institutional described above.

First, it is necessary to recall the basic definitions of financial assets and claims. In paragraph 10.4 of the 1993 SNA it is stated:

> "Financial claims and obligations arise out of contractual relationships entered into when one institutional unit provides funds to the other. A financial claim may be defined as:
>
> An asset that entitles its owner, the creditor, to receive a payment, or series of payments, from the other unit, the debtor, in certain circumstances specified in the contract between them."

Ownership of other assets does not generally imply the existence of a contractual relationship between two different institutional units. Second, the contract between a creditor and a debtor gives rise to transactions between them. The question at issue is not the treatment of real holding gains or losses but the correct classification of actual monetary transactions between units. When there is high inflation and consequential high nominal or indexed interest, most of the payment made by the debtor to the creditor represents a transfer of capital and not a payment of property income. The reason for making the transfer is quite another matter. It takes place because the creditor is able to obtain compensation

from the debtor by building into the contract between them. The creditor continues to incur a real holding holding loss which is quite properly recorded outside of the transactions accounts of the system. The compensation is built into the contract because, in contrast to other kinds of real gains or losses, it is predictable in advance. The payment of compensation is recorded quite separately from the loss itself, just as when compensation is received for accidental damage, which may also be recorded in the "other" changes in assets account.

Thus, because of the predictability of the real holding losses on loans and the existence of contracts between creditors and debtors, the real losses affect the behaviour of units and trigger transactions of a kind that do not occur with real gains or losses on non-financial assets. It is necessary to classify and record these transactions in accordance with economic criteria in the same way as all the other transactions in the system of accounts. The relevant accounting identity defining disposable income was derived earlier, namely:

disposable income = final consumption expenditures

**plus** change in **real** net worth

**minus** capital transfers receivable less payable

**minus** "other" volume changes in assets

**minus** **real** holding gains

**plus** **real** holding losses.

When a real holding loss occurs on a loan and compensation of equal value is recorded for the creditor under capital transfers receivable, the two items cancel each other out on the right side of the above identity. Thus, neither disposable income nor the change in real net worth is reduced by the occurrence of the real loss on the loan. The creditor is protected by the terms of the contract with the debtor.

The real holding loss is incurred by the creditor whether or not compensation is paid. It is recorded outside of the transactions accounts of the SNA in the "other" change in assets account in the same way as other real gains or losses. It is not deducted from nominal interest and does not cross the boundary between the transactions accounts and the "other" changes in assets account. Thus, recording real interest under high inflation does not set a precedent for recording real holding gains or losses on other types of assets alongside the flows in the primary income account. The economically correct treatment of interest simply requires an actual transaction, the payment of nominal interest, to be partitioned into two components and these components to be correctly classified, one as an income flow, real interest, and the other as a capital flow, the payment of compensation.

### Real holding gains and losses on other assets

As just explained, recording real rather than nominal interest does not imply treating the real holding losses on interest bearing assets as negative income and does not create a precedent which might be used to argue that real holding gains and losses in general should be treated as income. In any case, the question of whether to treat real holding gains or losses as income is not about inflation accounting. Inflation increases nominal holding gains, but does not necessarily increase the incidence or magnitude of real holding gains or losses on non-financial assets. It is possible that relative prices may be more flexible under high inflation, but any increase in the variability of relative prices is likely to be very small compared with the increases in the absolute price level. There may important changes in relative prices, for example in the price of land, even when there is no inflation. The associated real holding gains or losses need to be measured as they may cause significant changes in the distribution of wealth, but that is no justification for treating them as income flows. Their impact on behaviour and spending patterns is likely to be similar to those of capital transfers. Apart from the fact that attempting to include holding gains or losses in the transactions accounts of the SNA destroys the internal logic and consistency of those accounts, the economic arguments of Hicks for excluding holding gains and capital transfers from income remain as valid as they were 50 years ago.

**Financial Intermediation Services Indirectly Measured (FISIM)**

It does not follow that recording real rather than nominal interest would imply changes in the way that FISIM (financial intermediation services indirectly measured, see Annex III to the 1993 SNA) is estimated or allocated. In principle, interest data do not need to be used at all to estimate FISM. For example, a case can be made for calculating the value of FISIM by the relevant costs of production, including wage costs, plus an estimated mark up for the operating surplus. Thus, even if part of the nominal interest payments are recorded as a capital transfers rather than property incomes, nominal interest payments could continue to be used to estimate FISIM. The estimation and allocation of FISM is quite a separate question from the recording of interest under high inflation.

# 8. A GENERAL INDEX OF INFLATION

## INTRODUCTION

A general index of inflation is a price index designed to measure the rate of inflation in the economy as a whole. Inflation in its turn is generally understood to mean a process of continually rising prices, or equivalently, a situation in which the general purchasing power of money is continually falling. A general index of inflation is needed for several reasons.

- Situations of low, moderate, high and hyper inflation may be defined and differentiated by reference to the rate of increase of a general price index.
- Movements in a general price index may be used to evaluate the success or failure of economic policies. Policy targets may be framed in terms of maximum rates of increase in such an index.
- A general price index is needed for both business and national accounting purposes. In the a general index is needed:
  1. to calculate neutral and real holding gains and losses (see paragraphs 12.63 to 12.115 of the 1993 SNA and also the Annex to Chapter XII);
  2. to calculate trading gains and losses, and real national and disposable income (see paragraphs 16.148 to 16.161 of the 1993 SNA);
  3. to calculate real interest under conditions of moderate or high inflation;
  4. to calculate constant price level (CPL) accounts under conditions of high inflation (see Chapter 3 below).

  In business accounting a general index is needed for Current Purchasing Power Accounting, or CPP. When CPP is used, a general price index is applied to historical cost in order to allow for the decline in the value of money due to inflation. CPP accounting is similar CPL accounting.
- A general price index may be may useful for implementing indexation agreements under which prices or rates of payments subject to contractual agreements between institutional units or government control are linked to the level of such an index. In practice, a more specific index, usually the consumer price index, may be used for this purpose.

## EXISTING PRICE INDICES

Before considering the possible definition, coverage, formula and other properties of a general price index, the various types of indices that are already to be found in most countries will be briefly reviewed.

### 1. Consumer price indices

Consumer price indices are compiled in all countries. There is an extensive literature on the purpose and methodology of consumer price indices which need not be summarised here. Consumer price indices are widely used as proxies for general price indices to monitor the rate of inflation, to set policy targets, for indexation agreements, and so on. The following typical characterisics of consumer price indices are important in explaining their widespread use.

- they can be easily explained and understood as measuring the increase in the cost of buying a familiar basket of goods and services;

- they are published frequently and measure changes over short intervals of time, usually a month but sometimes a quarter;
- they are published very soon after the end of the month or quarter to which they refer, usually within a few weeks;
- in most countries, they are not revised after they are first published.

In short, they possess the inestimable virtues of intelligibility, high frequency, timeliness and certainty. It may be vital for indexation agreements to use indices that are not subject to revision, even though the quality of the index may suffer if later information cannot be taken into account.

**2. Producer and wholesale price indices**

These indices are also usually compiled monthly and with little delay. They do not attract the same attention as consumer price indices because they serve more specific purposes and are not so relevant to the general public. The nature and coverage of these kinds of indices may vary considerably from country to country. They can provide a great deal of information about price changes occurring in the economy.

**3. Export and import price indices**

These indices are usually available monthly or quarterly. They have traditionally been confined to merchandise trade but are being extended in some countries to cover trade in services. These indices frequently use the average, or unit, values of groups of similar, but not homogeneous, goods instead of price observations on carefully specified goods. As a result, the indices may be subject to substantial bias by failing to allow for changes in the average quality of the group of goods covered. Nevertheless, average value indices may provide a rough indication of price movements, provided the quality mix does not change too much.

**4. Wage rate and earnings indices**

These indices are usually available monthly or quarterly. Their coverage may be restricted to particular categories of workers, such as manual workers.

**5. Price indices in national accounts**

The coverage of price indices for the main aggregates in national accounts, such as GDP, is much broader than for any of the indices listed above. However, these indices are typically available only annually or, at best, quarterly. Moreover, the annual indices are usually published at least six months after the end of the year, unless quarterly accounts are compiled. Quarterly accounts are typically available with a delay of six to nine weeks and provide provisional estimates for the last four quarters.

The price indices in national accounts are generally obtained by utilising price information collected for other purposes; *i.e.*, to compile one or other of the indices listed above. The underlying price data may be reclassified, regrouped and reweighted to suit the requirements of national accounts. The national accounts tend to group together and repackage data from other sources and may not provide much new information about price changes in the economy.

The fact that the price indices in national accounts may only be available annually, or for some countries quarterly, and then only after a significant delay, suggests that, despite their wide coverage, they are not sufficient to meet all the demands that may be made on a general index of inflation. They may have to be supplemented by more timely and more frequent indices.

## GENERAL MEASURES OF INFLATION

In a national accounts context, a general price index is needed to calculate neutral and real holding gains or losses, real interest, constant intra-period price level, or CPL, accounts, trading gains, real national income and disposable income. A general price index is not needed to compile accounts at

constant prices although it may be used in conjunction with constant price data to measure trading gains. The main reason for calculating a broadly based price index is to obtain an estimate of the change in the general purchasing power of money between two points of time. These points of time are not necessarily in different accounting periods. To calculate CPL accounts for a single year, for example, a price index is needed to measure the change in the general price level from month to month, or quarter to quarter, within the year in question. To calculate real holding gains on assets and liabilities estimates of changes in the price level between different points of time within the same accounting period are also needed. In general, therefore, it is not sufficient for national accounts purposes to have a general price index covering entire quarters or years. The index must also be available monthly, at least under inflationary conditions.

Suppose it is decided to choose the price index for some broad national accounts aggregate, such as total final expenditures or GDP, as the general price index. Assuming that the accounts themselves are compiled only annually or quarterly, the index is unlikely to be available frequently enough to meet all needs, even all national accounts needs. In practice, therefore, some monthly index with more restricted coverage, or an existing index such as the consumer price index, may also be needed to interpolate or extrapolate the month to month movements in the more broadly based quarterly or annual national accounts price index.

Whatever index is chosen to measure changes in the general purchasing power of money, it remains only one out of a range of indices available to analysts and policy makers. Agreement on a general price index should not drive out other indices needed to analyse the determinants of inflation or its impact on different groups within the economy. For example, it will be argued below that intermediate flows should be excluded from the general index but this must not be interpreted as suggesting that it is not necessary to collect information about the prices of intermediate goods and services.

One major question is whether a general index of inflation should cover both stocks and flows or be confined to flows of goods and services. Price indices for stocks of assets could possibly be used in a national accounts context to measure real holding gains or losses, but the theory underlying such indices is not well developed. There are also well known practical problems in valuing stocks of assets, especially natural assets and fixed assets subject to rapid obsolescence. There would also be severe practical problems in trying to compile price indices for assets more frequently than once per year. In addition, it would be difficult to decide what is the appropriate way in which to combine price indices for stocks and flows into a single overall index. For these kinds of reasons it is proposed here to address the more restricted question of what is the most appropriate multi-purpose general price index covering flows of goods and services in the economy as a whole.

**A price index for total supplies and uses**

Goods and services may be defined as in paragraphs 6.7 to 6.13 of the 1993 SNA. They are produced as outputs from processes of production, also as defined in the 1993 SNA, paragraphs 6.14 to 6.18. The supply and use tables, as explained in Chapter XV of the SNA, provide an appropriate comprehensive accounting framework for their analysis. The supply table shows all new goods and services produced by resident or non-resident producers becoming available within the economy during the accounting period. The use table shows how these goods and services were used for purposes of intermediate of final consumption, gross capital formation or exports.

At the level of the total economy, the following accounting identities hold both for the supply and use of an individual good or service and for the total supplies and uses of all goods and services in the economy.

total supply = total use

total supply = total output of resident producers + imports

total use = total intermediate use + total final use

As a point of departure, one possibility would be to compile a comprehensive price index covering the total supplies, or uses, of all goods and services. The weights are provided by the total values of the various goods and services in different time periods as shown in the first columns of the supply and use

tables of the SNA (see, for example, Table 15.1 of the 1993 SNA). Any of the indices proposed in Chapter XVI of the 1993 SNA – for example, chained Fisher or Tornqvist indices – could be compiled using these weights. A general price index for total supplies or uses has the advantage of being comprehensive and easily understood. However, it can be argued that it may actually be too comprehensive and that a better index might be obtained by excluding certain flows: for example, intermediate flows, or flows for which the values have been imputed. The case for using an index with more restricted coverage is elaborated in the following sections.

**A price index for total final expenditures (or total final supplies and uses)**

In national accounts, the values of intermediate goods and services are deducted from the values of the total outputs produced by resident producers in order to obtain an aggregate measure of production which avoids double counting them when the outputs of different producers are summed across the economy. While this treatment of intermediate goods and services is justified when the objective is to obtain an unduplicated measure of production, it is not so clear what is the most appropriate treatment of intermediate goods and services when the objective is to measure inflation in the economy. There are at least three possible ways of handling intermediate goods and services in an aggregate price index, as price changes for them could be assigned positive, zero or negative weights. In the index for total supplies or uses described in the previous section they are implicitly given equal, positive weights with final goods and services.

An alternative general price index is one for total **final** supplies or uses, or total final expenditures as they are often called. Implicitly, intermediate flows are given zero weight in such an index. The general point of principle involved is how a general index of inflation should treat price changes of goods and services used as inputs into the production of other goods and services. The same issue arises when considering how to treat changes in wage rates, or price changes for labour inputs.

One way of approching the issue is to consider the hypothetical situation in which all resident producers in the economy are viewed as if they formed part of one giant enterprise. If all their production accounts were to be consolidated, the only outputs remaining would be the goods and services flowing to final uses. A general measure of inflation based on this flow would be fully comprehensive as it would cover the entire output of the economy. Intermediate goods and services would carry zero weight in a general price index covering total output of the economy as they never leave the sphere of production. From the point of view of final consumers – households, government, and non-profit institutions – changes in the prices of intermediate goods and services are irrelevant as they do not purchase them for final consumption. Similarly, they are irrelevant for non-residents purchasing exports or enterprises purchasing fixed assets for capital formation.

In practice, however, producers are not combined into one giant enterprise and flows of intermediate goods and services account for a large part of the transactions taking place in the economy. Nevertheless, the appropriateness of including them alongside final flows in a general index of inflation is questionable. Consider, for example, a situation in which a general price index for final uses is stable – there is no inflation from the point of view of final users – but the price of some major intermediate good, such as fuel, tends to rise persistently, perhaps because it is becoming scarcer over time, to the extent that the price index for intermediate flows as a whole tends to rise. The fact that the price index for final uses does not also rise could be attributable to increased efficiency in the use of the intermediate good as a result of technical progress. In these circumstances, the fact that producers are able to absorb the the increased cost of the intermediate good without increasing the prices of their outputs must surely be taken as indicating the absence, rather than the presence, of general inflation. However, an index for total supplies and uses would tend to rise under the circumstances postulated.

A similar argument can be used for wage rates. Suppose there is no inflation for final uses but that wage rates show a persistent tendency to rise as a result of labour obtaining a share of the benefits of increased productivity resulting from improved efficiency due to technical progress. Under these assumptions, increases in money wages are equivalent to increases in real wages and make it possible for wage earners to increase their living standards in line with the increases in labour productivity. Both the

absolute and the relative price of labour may increase indefinitely without there being any general inflation, by assumption. Labour costs per unit of final output remain constant, notwithstanding the increase in wage rates. This suggests that wage rates should not be included in a general index of inflation for the same reason that intermediate flows should be excluded, namely they are inputs into production and not outputs.

It is worth reiterating that, in arguing that the prices of intermediate goods and services and wage rates should be excluded from a general price index used to measure the overall rate of inflation, it is not being suggested that there is no need to compile price indices for them. For analytical and policy purposes it may be important to know what is happening ot the prices of materials and fuel or wage rates as these can have a major impact on the prices of final goods and services. However, it is being argued that the achievement of zero inflation for final goods and services is sufficient in itself as policy objective and that it is inappropriate to go beyond this to try also to achieve zero inflation for the prices of all inputs into their production. The prices of some inputs, including labour, may show a persistent tendency to rise over the long run because their supply is limited without this necessarily causing general inflation if producers manage to absorb or contain such price increases without increasing the prices of their outputs, on average.

**The GDP price index**

An alternative general price index to that for total final uses, or expenditures, is that for GDP. The price index for GDP is often described as the GDP deflator as if the sole purpose of the index were to calculate GDP at constant prices. As the latter is equivalent to a Laspeyres type volume index, the requisite price index, or deflator, has to be Paasche type. However, if the objective is to calculate a general index of inflation the type of index formula used does not have to be prejudged. If Fisher indices are used, the price and the volume indices are treated symmetrically, both being Fisher type.

GDP is essentially a measure of domestic production, being defined as the sum of the gross values added produced by all resident producers. Provided flows are valued consistently, GDP at the level of the economy as a whole is also identical in value with total final uses, or expenditures, **minus** imports, the fundamental identity of national accounting. In terms of coverage, therefore, a GDP price index differs from one for total final uses by including the price index for imports but with a **negative** weight.

A GDP price index is a measure of inflation of domestic origin attributable to processes of production undertaken within resident enterprises. For some purposes, including some policy purposes, this may be the relevant measure. However, the GDP index is not a measure of general inflation because it is specifically designed to take out the price increases of imported goods and services. Prices may be rising in the economy because of rising import prices even though domestic production may make no contribution to inflation. Thus, the price index for total final uses, or expenditures, is the more comprehensive measure of the general rate of inflation in the economy, whether of domestic origin or not, the GDP price index measuring only the domestic component of inflation. The difference can be important for open economies, especially small open economies, in which a very large part of total supplies may be coming from abroad.

Value added is a measure appertaining to an establishment or enterprise, or group of such producer units, rather than a flow of goods and services. As it represents the difference in value between outputs and inputs it cannot be identified with a specific, observable set of goods and services and cannot, therefore, be factored into its own quantity and price units. Price and volume indices for value added have to be derived algebraically from the difference between the price and volume indices for outputs and inputs, just as value added is itself obtained residually as a balancing item. The indices are therefore sensitive to errors in both the output and the input indices. Even at the level of the total economy, GDP cannot be identified with a specific set of goods and services (except in the case of a closed economy with no foreign trade) as imports cannot be removed from total final uses in a physical sense.

Total final uses, on the other hand, consist of a clearly defined set of goods and services for which conventional price and volume indices may be calculated using standard index number theory and practice. The goods and services may all be valued consistently at purchasers' prices, or market prices as

they are generally descibed in economics. The f.o.b. prices used to value exports are, in fact, the purchasers prices paid by non-residents taking delivery at the frontier of the exporting country. The calculation of GDP, and price and volume measures for GDP, on the other hand, is complicated by the fact that the SNA uses different prices to value outputs and inputs, namely basic and purchasers prices, while imports are not valued consistently with other expenditures, whether intermediate or final, as taxes on imports are not included. The use of different prices to value different flows makes the calculation and interpretion of price and volume indices for GDP complicated in comparison with simplicity of the final expenditure indices.

It may be concluded, therefore, that while a price index for GDP has its uses as a measure of the domestic component of inflation, the price index for final expenditures provides a more comprehensive and conceptually clearer measure of general inflation.

**A price index for domestic final expenditures, or uses**

An alternative general price index suggested in the 1993 SNA is that for gross domestic final expenditures (see paragraphs 16.153 to 16.161). Gross domestic final expenditures, or uses, consist of final consumption expenditures plus gross domestic capital formation. A price index for gross domestic final expenditures is a broadly based index relevant to economic units making final expenditures within the economic territory, but it is not as comprehensive an indicator of inflation within the economy as the other indices considered above. Consider, for example, a scenario in which the price index for domestic final uses is constant, but the f.o.b. price index for exports is rising while that for imports is falling. In such a situation, the price index for total final expenditures would be rising and that for GDP rising even faster. From an analytical and policy point of view, a situation in which domestically generated inflation is being offset by favourable movements in the terms of trade could not be treated as a situation of zero inflation.

**Four indicators of inflation: a summary**

Four price indices that might be used as general indicators of inflation were considered in the previous sections. The indices referred to the following flows of goods and services:

1. total supplies, or uses, of goods or services in the economy;
2. total final uses of goods and services, or total final expenditures;
3. GDP;
4. total gross domestic final expenditures.

The first index gives equal weight to intermediate goods and services used up as inputs into production as to the goods and services in which they are incorporated. Such a procedure seems to give too much weight to intermediate goods and services. Not all increases in the prices of inputs are symptomatic of general inflation. There could be systematic tendencies for the prices of certain kinds of intermediate inputs to rise both absolutely and relatively to output prices because of limits on their supply in the long run – fossil fuels and some mineral deposits may provide examples. In a non-inflationary situation, producers would absorb these increased input prices by increased efficiency in the use of the inputs or by substituting other inputs without increasing output prices. The market mechanism must still be allowed to operate in a situation of zero inflation. This may require input prices to rise relatively to output prices, on average, so that a price index for total supplies and uses could be increasing even though final output prices are not rising, on average. For similar reasons, wages and land rents might also be rising, both absolutely and relatively to output prices, without causing general inflation. A price index for total final uses, or expenditures, seems preferable, therefore, as a general index of inflation even though its coverage is not so extensive as one for total supplies and uses, or indeed even broader indices that might be constructed embracing wage rates and rents as well.

The GDP price index measures the rate of inflation for domestic production. The price index for total final expenditures, on the other hand, is a weighted average of the price indices for both imports and GDP, and therefore reflects both imported and domestically generated inflation. It is a better measure of general

inflation in the economy and provides a more suitable index for the calculation of constant price level, or CPL, accounts for example. Of course, the price index for GDP remains important for analytic and policy purposes as it is necessary to know to what extent inflation is of domestic origin.

The fourth index, that for gross domestic expenditures, also reflects the effects of imported as well as domestically generated inflation, but excludes exports. It can therefore be regarded as an appropriate index for purposes of measuring changes in purchasing power for resident units within their own country. For this reason, it is suggested as a general price to be used for calculating trading gains and real national income in the 1993 SNA (see paragraphs 16.1453 to 16.161). It may also provide a suitable index for the calculation of neutral and real holding gains and losses accruing to resident units. However, by excluding goods and services produced for export, it may not provide the best indicator of the rate of inflation in the economy as a whole. In some countries, exports may account for a substantial proportion of total production.

For most purposes, the price indices for total final expenditores and gross domestic expenditures seem to provide more suitable indicators of the rate of general inflation than the indices for GDP or total supplies and uses. The choice between them must be governed to some extent by the use for which they are intended and it is difficult to argue that one measure is inherently superior to the others for all purposes. In general, it would appear desirable to make both the indices for final expenditures and also that for GDP available to analysts and policy makers.

## FLOWS FOR WHICH VALUES ARE IMPUTED

In national accounts, all the major aggregates, such as the four considered in the previous section for which price indices may be compiled, have components whose values have been imputed because the goods and services are not bought and sold on the market. As there are no market prices for these components, they provide no information about price changes taking place in the economy. It is must be questioned whether it is appropriate to retain them when calculating the price indices.

As explained in Chapter 2, values have to be "imputed", (*i.e.*, estimated) for the non-monetary and internal transactions that are recorded in the transactions accounts of the SNA. The general principle adopted is that, whenever possible, the goods and services involved should be valued at the average prices of similar goods and services sold in sufficiently large quantities on the market at economically significant prices. If it is not possible to calculate reliable average prices, the goods and services may have to be valued on the basis of their total costs of production.

The goods and services involved in non-monetary or internal transactions are actual goods and services similar to those involved in monetary transactions. The quantities are real enough and have to be counted as part of production, consumption or capital formation in national accounts. In order to be able to include them in the accounts at current prices, monetary values have to be imputed for them. Once these values have been imputed, volume indices can also to be estimated for them and they are included in volume measures of GDP. Implicitly, therefore, not only prices but price changes are imputed for these flows. However, whereas the volume changes can be related to actual, observable quantities the price changes are based entirely on assumptions. Thus, while it may be appropriate to include these flows in current and constant price national accounts, this may not justify retaining them in a general price index. In order to appreciate the magnitude of the non-monetary flows in national accounts it is useful to list them all.

### The main categories of flows with imputed values

The first set of flows with imputed values consists of goods and services produced **for own final use**: namely,

1. the production by households or enterprises of agricultural and other goods for own final consumption or gross fixed capital formation;

2. the production by owner-occupier households of housing services for own final consumption and also the production of domestic services by paid employees within households.

The second set consists of goods and services used for **barter** or for **payments in kind**. This set includes,

3. the provision of services without charge by financial intermediaries to their customers by paying lower interest to depositors than they charge to borrowers;
4. the payment of compensation of employees in kind.

The third set consists of so-called **non-market** production and the associated consumption. Non-market production in the SNA consists of goods or, more usually, services that are provided free, or at economically insignificant prices (see paragraph 6.50 of the 1993 SNA), by their producers to their consumers. They consist of services, such as education or health, provided by governments to individual households and collective services, mainly public administration and defence, provided to the community as a whole or large sections of the community. Non-market services may also be provided by non-profit institutions. Although token prices may sometimes be charged that cover only a small fraction of the costs of producing the services in question, they are not used in the SNA to value the services when the prices are deemed not to be economically significant. It would also seem appropriate to ignore such token prices when seeking to measure inflation.

Systematically eliminating non-monetary transactions from the transactions accounts of the SNA would radically change the nature of the accounts by eliminating many real flows of goods and services of considerable economic significance. The concept of GDP that would emerge from such a system would be unrecognisable by most users and its analytical value is non-proven. However, it would be quite easy to remove the non-monetary flows from each of the four price indices considered in the previous section provided the consequences do not have to be tracked backwards through the entire sequence of accounts. The various categories that would have to be deleted from final uses, or expenditures are listed below.

***Household final consumption expenditures***

In the case of household final consumption expenditures, the following categories would be eliminated:

1. Imputed expenditures on the consumption of goods produced for own final consumption. These are likely to consist mostly of food or other agricultural goods produced for own consumption but may also include clothing, utensils and other household goods.
2. Imputed expenditures on the consumption of housing services by owner-occupiers.
3. Imputed expenditures on goods and services received as compensation of employees in kind or through transfers in kind (except social transfers in kind which are excluded from household expenditures in any case, as explained in paragraphs 8.41 and 8.42 of the 1993 SNA).
4. Imputed expenditures on goods or services acquired in barter transactions.
5. Expenditures on non-market goods or services sold at prices that are not economically significant.

The imputed values of the individual non-market services provided to households by governments or NPISHs are not recorded under household final expenditures (although they are included in the actual consumption of housholds, as explained in Chapter IX of the 1993 SNA, paragraphs 9.72 to 9.74).

***Final consumption expenditures of general government and* NPISHs**

In the case of the final consumption expenditures of governments and NPISHs, the following categories would have to be eliminated:

6. Imputed expenditures on non-market goods and services provided to individual households – education, health, transport, etc.
7. Imputed expenditures on non-market collective services provided to the community – public administration, defence, etc.

*Gross fixed capital formation*

In the case of gross fixed capital formation, the following categories would have to be eliminated:

8. Imputed expenditures by enterprises or households on buildings, dwellings or other structures produced for own use.
9. Imputed expenditures by enterprises on machinery and equipment produced for own use.

*Exports and imports*

In the case of transactions between residents and non-residents, the following categories would have to be eliminated:

10. Imputed expenditures by residents or non-residents on goods exchanged in barter transactions or transfers in kind.

Although this is rather a long list of exclusions, many of the items will be very small in most countries. The real difficulty may lie in estimating most of these items in the first place. To exclude them again subsequently would be relatively simple.

**Imputed prices based on market prices**

As noted above, values are imputed in national accounts in two fundamentally different ways:

either (1) on the basis of the average prices of the same kinds of products on the market,

or (2) on the basis of the costs of producing the goods or services in question.

In the former case, the inclusion or exclusion of the products in question in a general price index reduces to a matter of weighting. Consider the familiar example of the consumption of housing services by owner-occupiers. Prices for these services should be imputed on the basis of the rents paid on the market for rented accomodation of the same type and quality. The inclusion of own-account housing services in final consumption expenditures therefore implies that the weight given to changes in market rents in the general price index for final uses is correspondingly increased. Eliminating the imputed rents reduces the weight back to what it would be if the price index were confined to market rents in the first place. Another example is provided by agricultural goods produced for own final consumption or for barter. Including them effectively increases the weight given to changes in the market prices of agricultural goods. In general, when price changes are estimated on the basis of changes in the average market prices of similar products, the quality or reliability of the basic price information fed into the general price index may not be reduced, the question at issue being whether it is appropriate to increase the weight of market products when similar products are also produced but not sold.

**Imputed prices based on costs**

However, when values are imputed on the basis of costs of production the ensuing estimated price changes may be purely arbitrary and hypothetical. The main difficulty is how to make satisfactory estimates of price changes for the non-market output of general government and NPISHs (see paragraphs 6.49 to 6.52 of the 1993 SNA). As explained in the 1993 SNA, it is not possible to find equivalent market prices for the non-market services produced by government and provided to households, either individually or collectively. As a result, the value of the services produced and consumed in any given period has to be estimated on the basis of their costs of production (see paragraphs 6.90 and 6.91). This procedure may provide acceptable estimates of the monetary value of non-market output and consumption in any single period of time, but it throws no light on changes in output prices or quantities over time.

As explained in paragraphs 16.133 to 16.141 of the 1993 SNA, estimating the value of output at current prices on the basis of its costs of production does not imply that the price changes for outputs and inputs are the same. In principle, output volume indices could be estimated satisfactorily as weighted averages of changes in the quantities produced, even though there are no prices to accompany them. In practice, however, most statistical offices have little information about quantities of non-market goods and services because the collection of this kind of data is typically given very low priority.

Confronted with no information about either the prices or the quantities of non-market output, the conventional solution in national accounts is to assume that the volume of such output increases in proportion to the volume of inputs required to produce it or, equivalently, that the output price increases in proportion to the average change in the input prices. By ruling out any changes in productivity *a priori*, the price increases observed for the output of non-market services of government are almost invariably higher, on average, than for market goods and services produced in the rest of the economy. This stylised fact is entirely dependent on unsubstantiated assumptions made through lack of information. In fact, productivity growth might well be significantly slower for non-market than market goods and services, but equally well it could be higher. National accounts are usually incapable of providing satisfactory evidence either way.

The fact that the non-market production of government has to be included in GDP is no reason for automatically including them in a general index of inflation, at least when there is no reliable information about their price or volume movements. However, excluding non-market services would mean that certain important flows of goods and services would fail to be covered at all, either directly or indirectly, by the general price index, namely the intermediate goods and services used up in the production of non-market output. These include not only all the equipment, materials and supplies purchased for the production of public administration, public health and education but also for defence. Some of these, particulary military equipment, may be used exclusively in the production of non-market services. There is little justification for totally excluding such important flows of goods and services from an index that purports to measure general inflation.

If it is accepted that flows of final goods and services for which values are imputed should be excluded from a general index of inflation, the question which remains therefore is whether it is better to ignore this type of production altogether or to include the intermediate goods and services used up in their production within the index as a second best solution. Neither option is very satisfactory, but both seem preferable to including spurious price changes relating to imputed values in the index. On balance, it seems undesirable to leave out completely from the scope of the general price index intermediate goods and services purchased by non-market producers so that the second option seems preferable.

In any case, however, changes in the wage and salary rates paid by non-market producers should not be included, assuming that wage rates in general are excluded from the general price index. To include them as well as intermediate purchases as the major component of the price index for the non-market output of government would be tantamount to going back to the previously rejected national accounts solution.

Excluding flows for which values are imputed from price indices for final expenditures or gross domestic final expenditures can readily be explained to users. The indices can be described as covering "final market expenditures" and "domestic final market expenditures" respectively. If it decided also to include intermediate expenditures by non-market producers within the scope of these indices, it could be explained that they are treated as "quasi" final expenditures for purposes of the indices.

A price index covering domestic market production should also provide valuable information about inflation, but it is doubtful whether it should be described as an index for "market GDP" as this aggregate does not exist in the SNA. GDP excluding flows with imputed values is no longer GDP. The term "domestic market production" seems preferable and less likely to cause confusion. It can be defined as the aggregate gross value added of market producers. There seems little point in augmenting such a measure to cover the intermediate uses of non-market producers.

## SHORT TERM INDICES

Three indices emerge from the previous sections as useful, complementary indicators of general inflation: namely, the price indices for final market expenditures, final domestic market expenditures and domestic market production. All of them are derived from national accounts data which presumably cannot be available more frequently than quarterly, and then often only after some significant lapse ot time. As explained in Chapter 3, under high inflation monthly price indices are needed even for national accounts purposes in order to compile CPL accounts. In order to obtain appropriate monthly

indices it is clear that the annual or quarterly price indices relating to national accounts aggregates such as total final market expenditures have to be interpolated or extrapolated using whatever price indices may be available on a monthly basis.

The choice of short term indices to interpolate or extrapolate the longer term indices can only be determined pragmatically. The monthly consumer price index, or CPI, is bound to play an important role, and it may well be the most reliable, timely and acceptable indicator of short term price movements in many countries. In Chapters 3 and 4, it is explained that, under conditions of high inflation, it is essential to use accounting periods that are as short as possible so that national accounts have to be compiled on a quarterly basis. Assuming that general price indices of the kind described above are available quarterly and not simply annually, using the CPI to interpolate or extrapolate monthly movements between successive quarterly indices should provide acceptable results. However, if the general price indices are available only for complete years, it would be desirable to be able to incorporate information about price movements for fixed assets and exports, as well as for consumer goods and services, in the monthly index used for interpolation and extrapolation.

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